

QUESTION PAPERS
END TERM THEORY EXAMINATION
JULY-2021



a) B. TECH (OLD SCHEME)
II, IV, VI, & VIII SEMESTER

Issued
13/09/21

**QUESTION PAPERS FOR END TERM THEORY EXAMINATION
JULY, 2021
B.TECH (OLD SCHEME)
(SEM – II/IV/VI/VIII)**

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IInd SEMESTER

B.Tech.

END SEMESTER EXAMINATION

July/Aug-2021

PAPER CODE AC 104

APPLIED CHEMISTRY

Time: 2:00 Hours

Max. Marks : 70

Note : Answer All questions.

All questions carry equal marks.

Assume suitable missing data, if any.

- Q.1 (a) What is the difference between primary and secondary standard solutions? Give examples.
(b) Draw and explain a schematic block diagram of double beam UV-Visible spectrophotometer.
- Q.2 (a) What is the importance of thermal method of analysis? Differentiate between DTA and DSC by taking suitable example.
(b) Explain the mechanism of free radical addition polymerization by taking any suitable example.
- Q.3 (a) Define phase rule. Draw and explain phase diagram of water.
(b) Write the seven characteristic features of batteries.
- Q.4 (a) Write any seven principles of green chemistry. Explain any one in detail.
(b) Write the chemical reactions involved in Lead-Acid battery.
- Q.5 Write short note on any two of the following:
[a] Proteins
[b] Secondary batteries
[c] Nucleic Acids

Pages - 2

-02-

4th SEMESTER

B.Tech. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATION

July -2021

PAPER CODE AE-211 (Heat Transfer & Automotive air conditioning)

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1 (a) Derive an expression for overall heat transfer coefficient of a hollow cylinder covered with a layer of insulation. Do not neglect the effect of convection heat transfer coefficient.
(b) What is the significance of critical radius of insulation in case of a hollow pipe through which hot steam is flowing? Derive an expression for the critical radius of insulation of hollow cylinder.
- Q.2 (a) Derive an expression of temperature distribution through a fin. Consider the fin to be of infinite length.
(b) Define and explain (i) fin efficiency and (ii) fin effectiveness.
- Q.3 (a) Define and explain significance of following non dimensional numbers (i) Nusselt number (ii) Prandtl number (iii) Biot number
(b) Specify the various physical parameters on which the forced convection depends and establish a relationship showing that Nusselt number is a function of Reynolds Number and Prandtl number in forced convection.
- Q.4 (a) Derive an expression for LMTD of a parallel flow heat exchanger.
(b) Explain giving examples the following terms: (i) Unit of refrigeration (ii) COP (iii) ODP and GWP
- Q.5 (a) Discuss the desirable properties of a refrigerant.
(b) Draw neat sketch of vapour compression refrigeration cycle and explain various processes using T-s or P-h diagram.

P. T. O

- Q.6 (a) Define and explain (i) Dry bulb temperature (ii) Wet bulb temperature (iii) Specific humidity (iv) Relative Humidity.
- (b) Explain the following psychrometric processes : (i) Sensible heating (ii) Heating and humidification

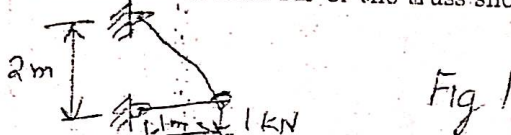
AE-213 MECHANICS OF SOLIDS

Time: 3 hrs

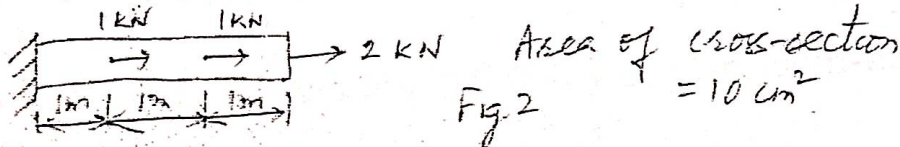
Max Marks : 70

Note: Answer all questions. All questions carry equal marks.
 Assume suitably missing data, if any.

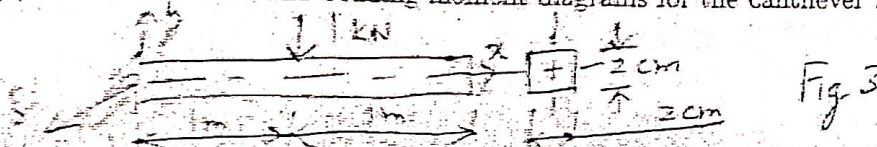
1(a) Calculate axial force in each bar of the truss shown in Fig. 1.



1(b) For the bar shown in Fig. 2, find the change in length when $E = 210 \text{ GPa}$. Find the strain energy stored in the bar.

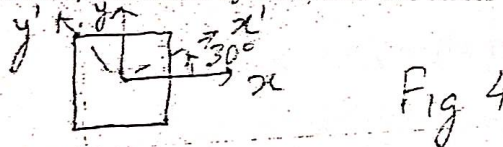


2(a) Draw shear force and bending moment diagrams for the cantilever shown in Fig. 3.



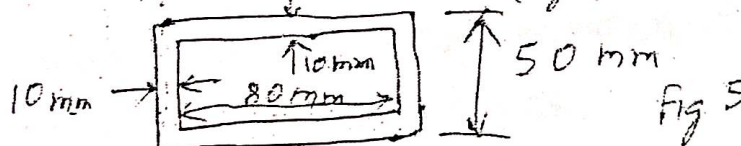
2(b) Find maximum bending stress in the cantilever in Fig. 3. Find equation of deflection curve of the cantilever.

3(a) A plane element (Fig. 4) is subjected to the stresses $\sigma_{xx} = 50 \text{ MPa}$, $\sigma_{yy} = 100 \text{ MPa}$, $\tau_{xy} = 25 \text{ MPa}$. For the rotated coordinate system, find the stress tensor.



3(b) A hollow shaft of inside diameter 10 cm and outside diameter 20 cm is subjected to a torque of 35 kNm. Find the maximum shear stress in the shaft. Find the twist in the shaft if length of shaft is 1 m and shear modulus is 210 GPa.

4(a) A steel column has a length of 5 m and is fixed at both ends. If the cross-sectional area has the dimensions shown, determine the critical load. (Fig 5)



4(b) Find radial and tangential stresses at inner and outer radii in a thick cylinder of outer radius 0.5m and thickness 0.1m for an internal pressure 5 MPa. Find radial and tangential strains. Find the change in dimension of inner radius. $E = 200 \text{ GPa}$ and $\nu = 0.3$.

5(a) Derive Euler's buckling load for pin-pin column.

5(b) Derive expression for strain energy for twisting of a circular rod.

Total No. of Pages 02

-05-

Roll No.....

IV SEMESTER

B.Tech./M.Tech./MBA/Ph.D./ B.Tech. (Evel I)

END SEMESTER EXAMINATION

July-2021

AE-214 ALTERNATIVE FUELS & ENERGY SYSTEMS

Time: 3:00 Hours

Max. Marks: 70

Note : Answer all question by Selecting any two parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1[a] Discuss the requirement and availability of petroleum-based fuels in Indian context.
- [b] What are the harmful health effects of exhaust emissions from IC engines?
- [c] CI or SI engine? Which can be easily converted to use gaseous fuels.
- Q.2[a] Discuss the material compatibility to use alcohols in IC engines.
- [b] Explain the methods to use alcohols in IC engines.
- [c] Explain the performance benefit of using alcohols in C I engines.
- Q.3[a] What is a dual fuel system? Discuss the principle and working arrangement.
- [b] Discuss the benefits of dual fuel operation on various engine operating parameters and emissions.
- [c] Explain the production setup of biogas and discuss its potential and limitations.

P.T.O

- Q.4[a] Explain the factors affecting the yield of biodiesel production.
- [b] Explain various catalysts used in biodiesel production.
- [c] Explain the methods to use vegetable oils directly in IC engines.
- Q.5[a] What are the commonly used layouts of an electric vehicle.
- [b] Compare the utility of electric vehicles with hybrid vehicles.
- [c] Explain is the concept of Solar powered vehicles. Discuss their feasibility and limitations.

Total No. of Pages 02

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Roll No.....

IV SEMESTER

B.Tech. [AE]

END SEMESTER EXAMINATION

July -2021

PAPER CODE: AE 215 TITLE OF PAPER: I. C. Engines

Time: 3:00 Hours

Max. Marks: 70

Note : Answer any Seven questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1[a] What do you mean by Auto – ignition? How can it be detected? [5]
- [b] Explain the phenomenon of knocking in S. I. engines. Describe the methods used to suppress it. [5]
- Q.2[a] Explain briefly the combustion phenomenon in C. I. engine.
- [b] Explain briefly diesel engine injected spray combustion process. [5X2=10]
- Q.3[a] With the help of a neat sketch explain the working principle of a simple carburettor. [5]
- [b] What are the drawbacks of a simple carburettor? How they are overcome. [5]
- Q.4[a] What is the importance and the objects of lubrication in I. C. engines? [5]
- [b] Explain with a neat sketch the forced circulation cooling system. [5]
- Q.5 What are the main pollutants emitted by petrol engine? Explain briefly their mechanism of formation. [10]

- Q.6 The factors that tend to increase detonation in S. I. engine tend to reduce knocking in C. I. engine. Discuss [10]
- Q.7 The highest compression ratio that can be used in a S. I. engine is limited by the detonation characteristics of the available fuel, Justify the statement. [10]
- Q.8 With the help of neat sketches explain the working of common rail, individual pump and distributor Fuel systems of CI engine. [10]
- Q.9 Compare the merits and demerits of Air, oil and water cooling systems. [10]
- Q.10 Explain briefly various methods by which S. I. engine emissions can be controlled. [10]

Note : Answer any FIVE questions.
 All questions carry equal marks.
 Assume suitable missing data, if any.

- 1 A four bar chain mechanism has different links as shown in Fig.1 has $AB=15$ mm, $BC=26$ mm, $CD=20$ mm, $AD=28$ mm, $BE=CE=14$ mm, $CE=12$ mm and $DG=15$ mm. Draw the velocity and acceleration diagram when the crank makes 60° and rotates uniformly with 180 rpm clockwise.

14

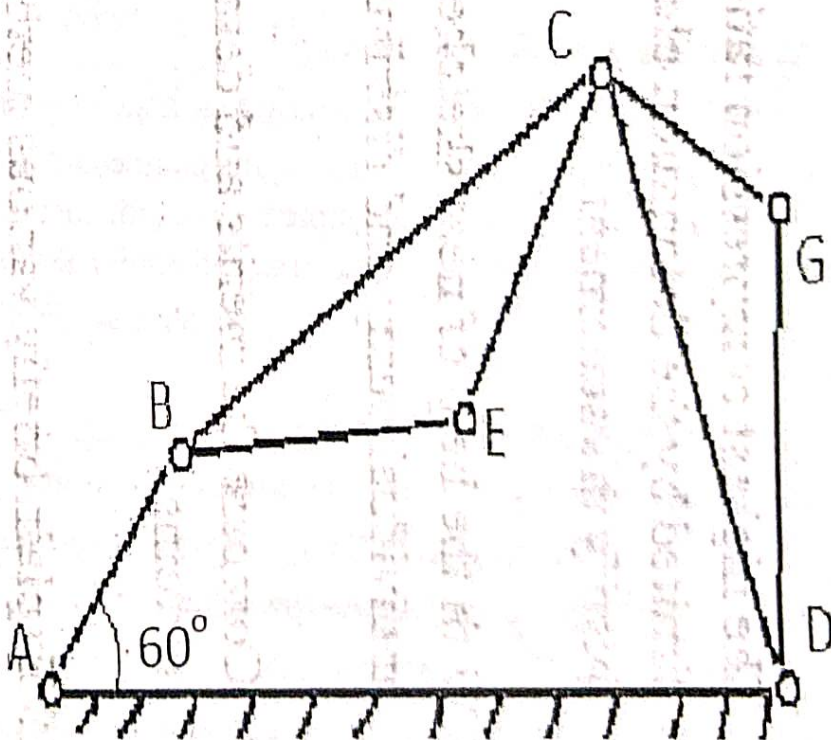


Fig.1

—09—

[a] Define kinematic chain and describe the inversions of the four bar chain.

[b] With the help of example, explain the degree of freedom for kinematic pair and kinematic chain.

[c] Describe the instantaneous centre (IC) of rotation and determine all the IC of single slider crank chain mechanisms with the help of sketch.

7x2=14

- 3 Q.3 Draw the displacement curve and cam profile for the roller follower having radius 16 mm (line of motion of the follower passes through the centre of rotation of the cam) to attain the following specification of cam-follower mechanism.

The base circle of cam has radius 20 mm and lift of follower is 18 mm.

The upward motion of follower is with SHM to 90° .

The dwell period at the top most position is 30° .

The return motion of follower is with uniform acceleration and retardation to 90° .

14

- 4 Attempt any two of the following:

[a] State and prove the law of gearing with the help of neat sketch.

[b] Describe tractive force and swaying couple and hammer blow in 90° crank, two cylinders, uncoupled and inside locomotive engine.

[c] Compare longitudinal, transverse and torsional vibrations.

7x2=14

- 5 Attempt any two of the following:

[a] Compare the function of flywheel and mechanical governor.

[b] Deduce the expression of the gyroscopic couple and describe its behaviour for stabilising of two-wheel vehicle.

[c] Describe the Ferguson's Paradox, an epicyclic gear train.

[d] Compare the constant pressure and uniform rate of wear theory during power transmission.

7x2=14

same radius in planes 1, 2, 3, 4 and 5 respectively. The distances between consecutive planes are same. The magnitude of masses in plane 1, 3 and 4 are 50 kg, 40 kg and 30 kg respectively. The position of masses 3 and 4 with respect to m_1 are 60° and 120° respectively. Determine the weight in planes 2 and 5 also their position with respect to plane in order to put the shaft in complete rotary balance. (Use graphical method).

14

- 7 A torsional system shown in Figure.2 below, has the following particulars:

The motor to flywheel shaft has diameter 6cm and length 175cm. Moment of inertia of motor = 35 kg-m^2 , combined moment of inertia of flywheel and pinion = 125 kg-m^2 , gear ratio = $N_B/N_C = G=4$, moment of inertia of the gear wheel = 40 kg-m^2 . Determine the moment of inertia of the pump so that the frequency of torsional oscillation of the system is equal to 7.32 cycles per second. Assume modulus of rigidity $C=84 \times 10^4 \text{ bar}$.

14

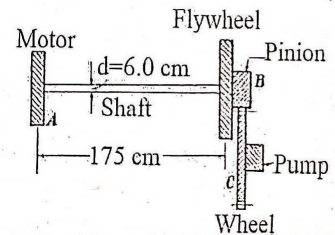


Fig.2

- 8 [a] What is understood by the term 'Angle of heel' related to a two wheeled drive?

4

[b] The rotor of the turbine of a ship has a mass of 1200 kg and rotates at 2000 rpm CW, as viewed from the stern. The radius of gyration of the rotor is 50 cm. Determine the gyroscopic couple and its effect upon the ship, when it is steering to the right at a radius of 80m with a speed of 28 km/hour.

10

END

Total no. of pages: 3

~~V~~ SEMESTER **VI**

Roll No: _____

END SEMESTER EXAMINATION

B. Tech. (AE)
July 2021

AE-311

Design of Machine Elements

Time: 3 Hour

Max. Marks: 70

Note: Attempt any 5 questions. Each carry equal marks.
Assume missing data, if any

Q-1 (a) It is required to standardise 11 speeds from 72 rpm to 720 rpm for a machine tool. Specify the speeds. [6]

(b) A pair of spur gear of 20° pressure angle consist of 24 teeth pinion mesh with 49 teeth gear. Module = 3 mm; face width = 40 mm; Ultimate tensile stress for gears material = 600 MPa and surface hardness = 500 BHN. Pinion rotation = 1450 rpm, service factor = 1.75, FOS = 1.5
Determine rated power that the gears can transmit. [8]

Q-2 A line shaft supporting two pulleys A and B is shown in Fig-1. Power is supplied to the shaft by means of a vertical belt on pulley A, which is then transmitted to pulley B carrying a horizontal belt. The ratio of belt tensions on tight and loose sides is 4:1. The maximum tension in belt is limited to 4 kN. The pulleys are keyed to the shaft. Determine the diameter of the shaft according to A.S.M.E code if it is subjected to gradually applied load. [14]

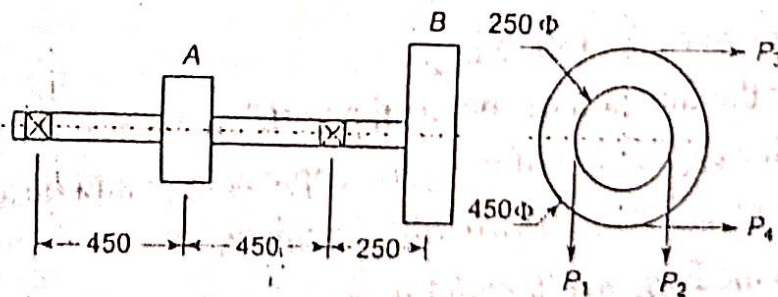


Fig.-1 (All dimensions are in mm)

Q-3 (a) Determine the diameter of rivets for a riveted joint subjected to an eccentric force of 75 kN as shown in Fig.-2. Assume that all the rivets are identical. [7]

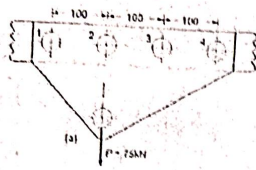


Fig. 2 (All dimensions are in mm)

(b) A rectangular cross-section is welded to a support by means of fillet welds as shown in Fig.-3. Determine the size of the weld. [7]

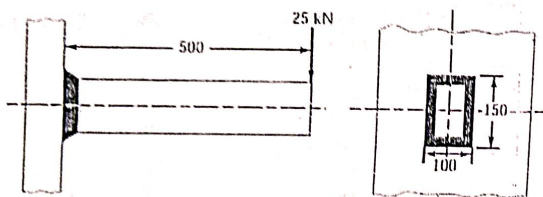


Fig.-3 (All dimensions are in mm)

Q-4 A centrifugal clutch has driving member consisting of a spider carrying four shoes which are kept from contact with the clutch by means of flat springs until increase of centrifugal force overcomes the resistance of the springs and the power is transmitted by the friction between the shoes and the case. Determine the necessary mass and size of each shoes if 22.5 kW is to be transmitted at 750 rpm with engagement beginning at 75% of the running speed. The inside diameter of the drum is 300 mm and the radial distance of the centre of gravity of each shoes from the shaft axis is 125 mm assume $\mu=0.25$. [14]

2/3

Q-5 A bracket in the form of a plate is fitted to a column by means of four rivets A, B, C, and D as shown in Fig.-4. E is the midpoint of BC. A load of 100 kN is applied at a horizontal distance of 150 mm from E. Determine the diameter of rivet and width of the plate. [14]

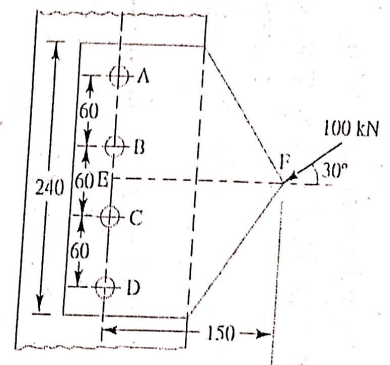


Fig.-4 (All dimensions are in mm)

Q-6 Design a bushed pin type flexible coupling to connect a pump shaft to a motor shaft. Transmitting 32 kW at 960 rpm. The overall torque is 20% more than the mean torque. Draw the neat sketch of the coupling. [14]

3/3

Pages: 2

VI SEMESTER Automobile

B.Tech (Even)

END SEMESTER EXAMINATION

July/Aug-2021

AE 312

Turbo Machinery & Gas Dynamics

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1 (a) Define turbomachine and explain the process of Energy transfer between fluid and rotor,
(b) Compare turbomachines with positive displacement machines (7,7)
- Q.2 (a) Define total to total, total to static, static to static and static to total efficiencies for power developing and power consuming turbomachines.
(b) Differentiate between fans, blowers and compressors specifying their characteristics and uses (7,7)
- Q.3 (a) Describe with neat sketch the flow in impeller blades, volute and diffusers
(b) Discuss the various losses in turbomachines (7,7)
- Q.4 (a) Define and explain any two of the following with regards to Compressors
(i) Impeller flow losses (ii) Slip factor (ii) Diffuser analysis losses
(b) How do you assess the performance of Compressors? Explain (7,7)

- Q.5 (a) Draw two stage velocity diagram of Axial Turbine stage
(b) How are the loss coefficients for stationary and moving rows of blades in a turbine stage defined? (7,7)
- Q.6 Discuss any two of the following
(i) Isentropic flow with Variable Area
(ii) Flow with Normal Shock waves
(iii) Flow in Constant Area Duct with Friction
(iv) Stagnation Properties (7,7)

Total No. of Pages 02

Roll No.

VIIITH SEMESTER

B. Tech (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATION

JULY 2021

AE 411 VEHICLE SAFETY ENGINEERING

Time: 3.0 Hours

Max. Marks: 70

Note: Attempt any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

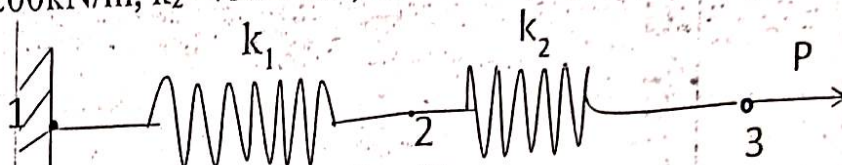
1. (A) Explain the working principle of air bag with electronic activating system? Explain the working of a typical adaptive cruise control system used in modern car. 7
(B) What is the basic difference between MPFI and CRDI system? 7
2. (A) Explain the different safety features incorporated in the design of passenger car bodies. 7
(B) Explain the construction and working of ABS system and traction control system. 7
3. (A) What is G.P.S.? How this system enhances the convenience and safety of a passenger car. 7
(B) Explain the design requirement of frontal collision 7
4. (A) Explain the influence of engine location on safety, with neat sketch. 7

- (B) Explain the application of two software used in accidental reconstruction analysis. 7
5. (A) Briefly explain the safety design aspects of car with the support of three safety gadgets. 7
- (B) Explain in detail with the help of circuit diagram the interaction of object detection system with breaking system. 7
6. (A) Explain the key issue in vehicle safety in India. Support your answer with case study. 7
- (B) How does a typical speedometer work? 7
7. Short Note on any two: 14
- (A) Electronic stability programme.
 - (B) Central motor vehicle act (1989)
 - (C) Bharat stage VI

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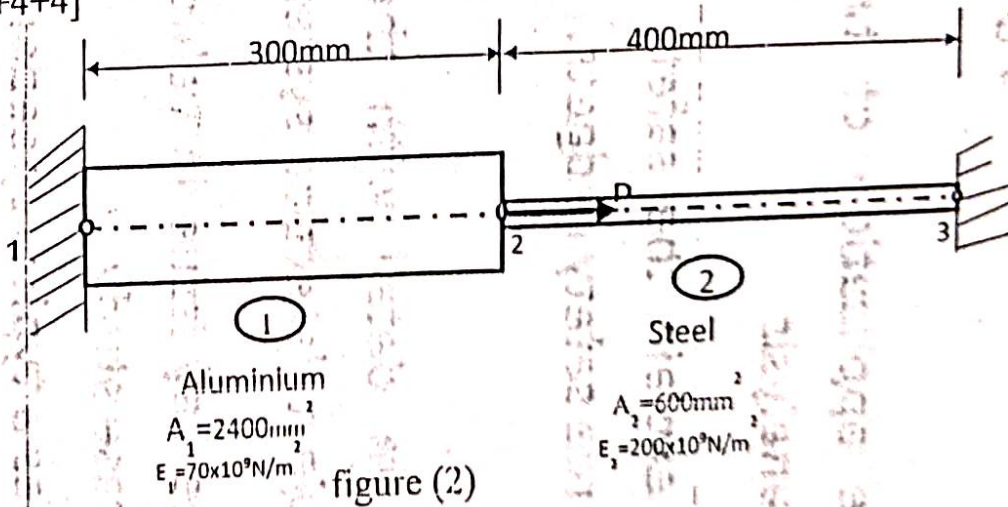
Note: Answer Any Five Questions. Assume suitable missing data, if any.

- (1) Consider the two-element spring system shown in figure(1). Given $k_1=200\text{kN/m}$, $k_2=400\text{kN/m}$, and $P=30\text{kN}$, determine:



- (a) The global stiffness matrix for system. [5+5+4]
 (b) The displacements at nodes 2 and 3.
 (c) The reaction at node 1.

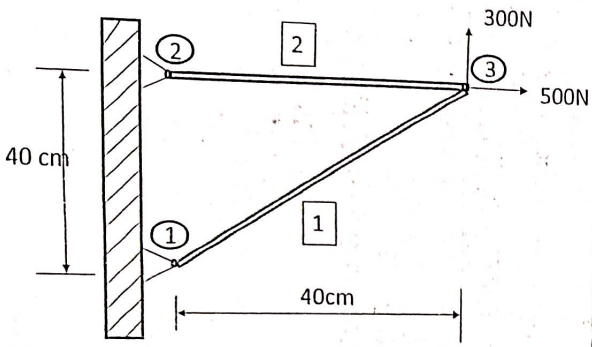
- (2) The bar is loaded as shown in the figure (2). Determine the nodal displacement, element stresses. Given $P=200\text{kN}$
 [6+4+4]



- (3) Consider the two element truss and the loading condition shown in figure(3). Modulus of elasticity $E=2 \times 10^7 \text{N/cm}^2$ and cross sectional area of the members are $A_1= A_2=1.5 \text{ cm}^2$. Using the same node and element numbers indicated in figure, determine the following.

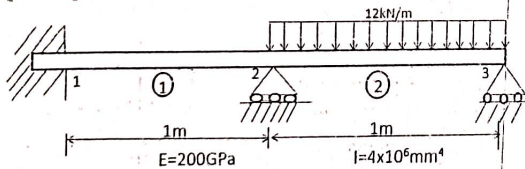
- a) The element stiffness matrix of element 1 in local and global co-ordinate system.
 b) The element stiffness matrix of element 2 in local and global co-ordinate system.

- d) Apply boundary condition and find displacements at node 3.
 e) Find the member force. [2+2+3+4+3]



figure(3)

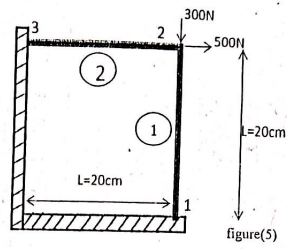
- (4) For the beam and loading shown in figure(4). Determine
 (i) the slopes at 2 and 3 and
 (ii) the deflection at mid point of the distributed load. [4+4+6]



figure(4)

2

- (5) A frame shown in figure(5) is made of two identical beams of length 20 cm and square cross section (1 cm x 1 cm). Modulus of elasticity $E = 2 \times 10^7 \text{ N/cm}^2$. The frame is modeled with two beam elements. Evaluate global stiffness and load vector. Apply boundary condition and find displacement at nodes. [6+4+4]



Axial problem

$$\frac{EA}{a} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} = \{f_a\}$$

Bending problem

$$\frac{EI}{a^3} \begin{bmatrix} 12 & 6a & -12 & 6a \\ 6a & 4a^2 & -6a & 2a^2 \\ -12 & -6a & 12 & -6a \\ 6a & 2a^2 & -6a & 4a^2 \end{bmatrix} \begin{Bmatrix} w_1 \\ \theta_1 \\ w_2 \\ \theta_2 \end{Bmatrix} = \{f_b\}, \quad \theta = \frac{\partial w}{\partial x}$$

- (6) Consider isoparametric mapping of four node non-rectangular element figure(6) under plane stress condition.
 (i) write element shape functions for isoparametric mapping
 (ii) write the expression for Jacobi matrix and calculate it at the centre of the element. [4+10]

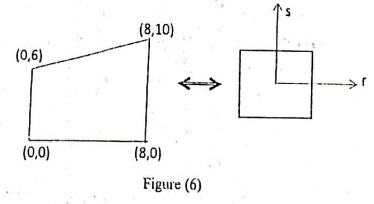


Figure (6)

- (7) Formulate the stiffness matrix of a triangular finite element for solving plane stress problems. [14]

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Total No. of Pages: 02
IVth SEMESTER

Roll No.:
B. Tech.

End Sem. Old Scheme Examination

July 2021

MC - 211 *Real Analysis*

Time: 3 Hours

Max. Marks: 70

Note: Attempt all the questions by selecting any two parts from each question

- (1) (a) Define the set of real numbers and write properties of natural numbers.
- (b) Show that $\sqrt{3}$ is an irrational number.
- (c) Define the *countable* and *uncountable* sets with example. Prove that the set $[0, 1]$ is uncountable. (14)
- (2) (a) Define convergence of the sequence of real numbers and prove that a sequence cannot converge to more than one limit.
- (b) Define a *subsequence* and *Cauchy sequence* with example. Show that every *Cauchy* sequence of real numbers is convergent.
- (c) Show that every convergent sequence of real numbers is a *Cauchy* sequence (14)
- (3) (a) Define the *Metric Space*. Let (X, ρ) be any metric space then show that the function ρ^* defined by

$$\rho^*(x, y) = \frac{\rho(x, y)}{1 + \rho(x, y)}, \forall x, y \in X$$

- is a metric on X .
- (b) In a metric space prove that the intersection of a finite number of open sets is open. Is arbitrary intersection of open sets open? Justify.
- (c) Show that every open sphere(ball) is an open set, in (X, ρ) . (14)
- (4) (a) Prove that every convergent sequence in a metric space is a *Cauchy* sequence, but converse is not necessarily true with example.
- (b) Let $f(x) = x^2$ on $[0, k]$, $k > 0$, then show that $f \in \mathcal{R}[0, k]$ and

$$\int_0^k f dx = \frac{k^3}{3}.$$

(c) If \mathcal{P}^* is a refinement of a partition \mathcal{P} , then for a bounded function f show that

$$L(\mathcal{P}^*, f) \geq L(\mathcal{P}, f) \text{ and } U(\mathcal{P}^*, f) \leq U(\mathcal{P}, f). \tag{14}$$

(5) (a) Prove that a bounded function $f : [a, b] \rightarrow \mathbb{R}$ is integrable if and only if for each $\varepsilon > 0$ there exists a partition \mathcal{P} of $[a, b]$ such that

$$U(\mathcal{P}, f) - L(\mathcal{P}, f) < \varepsilon.$$

(b) Prove that every continuous function is integrable.

(c) Let a, c, b be real numbers with $a < c < b$, and consider any function $f : [a, b] \rightarrow \mathbb{R}$ which is integrable over $[a, c]$ and over $[c, b]$. Then show that $f \in \mathcal{R}[a, b]$, and

$$\int_a^b f = \int_a^c f + \int_c^b f \tag{14}$$

=====x=====

MC-212 LINEAR ALGEBRA

Time: 3Hrs.

Max. Marks: 70

Note: Answer ALL questions. Select any TWO parts from each question. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 [a] Find the conditions on a, b, c so that $v = (a, b, c)$ in $V_3(\mathbb{R})$ belongs to the subspace spanned by $v_1 = (1, 2, 0), v_2 = (-1, 1, 2), v_3 = (3, 0, -4)$.

[b] Express $(2, -5, 3)$ in \mathbb{R}^3 as a linear combination of the vectors $(1, -3, 2), (2, -4, -1), (1, -5, 7)$.

[c] Define subspace of a vector space and write the necessary and sufficient condition for a non-empty subset W of a vector space $V(F)$ to be a subspace of V .

Q.2 [a] Define linear span of a set. Prove that the linear span of any subset S of $V(F)$ is a subspace of $V(F)$.

[b] If $U(F)$ and $V(F)$ are two vector spaces and $T: U(F) \rightarrow V(F)$, prove that the null space is a subspace of $U(F)$.

[c] Let T be a linear operator of $V_3(\mathbb{R})$ defined by

$$T(x, y, z) = (3x, x - y, 2x + y + z)$$

Is T is non-singular? If so, find a rule for T^{-1} .

Q.3 [a] Define dual basis and hence find the dual basis of the basis

$$B = \{ (1, -1, 3), (0, 1, -1), (0, 3, -2) \} \text{ of } V_3(\mathbb{R}).$$

[b] For the linear operator $T: V_2(\mathbb{R}) \rightarrow V_2(\mathbb{R})$, find all eigenvalues and basis for each eigen space for the defined transformation

$$T(x, y) = (3x + 3y, x + 5y).$$

(P.T.O.)

[c] For any two vectors u and v in an inner product space V , prove that $\|u+v\|^2 \leq \|u\|^2 + \|v\|^2$.

Q.4 [a] In an inner product space $V(F)$, prove that (i) $(a\alpha - b\beta, \gamma) = a(\alpha, \gamma) - b(\beta, \gamma)$ and (ii) $(\alpha, a\beta + b\gamma) = \bar{a}(\alpha, \beta) + \bar{b}(\alpha, \gamma)$.

[b] Define orthogonality and orthonormal set in inner product space.

[c] If $\alpha = (a_1, a_2)$ and $\beta = (b_1, b_2)$ are elements of $V_2(R)$, prove that the product $(\alpha, \beta) = a_1b_1 - a_2b_2 + 4a_2b_2$ is an inner product space.

Q.5 [a] Prove that if two vectors are linearly dependent, one of them is a scalar multiple of the other.

[b] Show that the three vectors $(1, 1, -1), (2, -3, 5), (-2, 1, 4)$ of R^3 are linearly independent.

[c] Let f be the bilinear form on defined by $f((x_1, x_2), (y_1, y_2)) = (x_1 + x_2)(y_1 + y_2)$, Find the matrix of f in the standard ordered basis $B = \{(1, 0), (0, 1)\}$.

END SEMESTER EXAMINATION

MC-213 DIGITAL LOGIC DESIGN

Time: 3 Hours

Max. Marks: 70

Answer any Five Questions
Assume suitable missing data, if any

1. (a) Reduce and implement the function using AOI gates and NAND gates 7M
$$F = F = \overline{A(B + C)} + \overline{AB} + \overline{C(A + B)}$$

(b) Simplify the equation using D-Morgan's Law $(\overline{A + \overline{BC}.D}).E$ 4M
(c) Realize a half adder cum subtractor circuit. The function can be controlled by a mode signal 3M
 2. Reduce the following function using by using Quine-Mcclusky method 14M
$$\sum m(0,1,5,9,10,12,14,16,19,20,21,27,31) + d(7,11,28,31)$$
 3. (a) What is EPROM and EEPROM? State their uses and also compare them? 7M
(b) Implement the equation $F(A, B, C, D) = \sum (0, 2, 3, 6, 7, 8, 10, 12, 13)$ using a 4:1 Multiplexer. 7M
 4. (a) Draw the Master slave JK flip flop using NAND gates and explain the race around condition in detail 9M
(b) Design a synchronous decade counter? 5M
 5. (a) Explain the working of a 5 bit universal shift register 7M
(b) Design one bit comparator 4M
(c) State the specifications of ADC 3M
 6. (a) Design a 8x3 encoder using behavior model of VHDL 7M
(b) Design a circuit and draw the state diagram and ASM chart for 2 bit up-down counter. 7M
- 2x7=14
7. Write short notes on any TWO of the following:
- (a) Dual slope ADC
 - (b) PLD devices
 - (c) Advantages and Disadvantages of HDL
 - (d) Gray Code convertors

Total No of pages: 01

B. Tech

Subject code: MC-215

Time 3:00 Hours

Answer any seven questions and all questions have equal value

Roll Number-----

Fourth Semester Examination July-2021

Scientific Computation

Maximum marks: 70

1. Use Taylor's expansion for $f(x) = \frac{1}{x}$ about $x_0 = 1$, truncated up to four terms, compute inverse of 2.
2. Solve by Gauss Jordan method of the matrix equation $Ax = b$, where $A = [2, 5, 1, 8; 1, 6, 3, 5; 7, 2, 6, 3; 4, 8, 1, 2]$ and $b^T = (5, 11, 14, 19)$
3. Compute the numerically largest Eigen value and corresponding Eigen vector of the following matrix A by power method $A = [5, -2, 0; 1, 2, -3; 1, -2, 4]$
4. Find the roots of the equation $x^2 - \cos x = 0$ by the Newton Raphson method correct up to 3 decimal places.
5. Following table shows the value of $\ln x$ for $x = 2.00 (0.05) 2.25$

X	2.00	2.05	2.10	2.15	2.20	2.25
Ln x	0.69315	0.71784	0.74194	0.76547	0.78846	0.81093

Compute the value of (i) $\ln 2.07$ and (ii) $\ln 2.21$

6. Four values of the function $y = x^3$ are provided as follows

x	0	1	2	3
y	0	1	8	27

Compute cube root of 21 from the above data using Lagrange's method. Discuss the error in the result.

7. From the following data find y' and y'' at $x = 2.00$ using up to third differences only

X	2.00	2.20	2.40	2.60	2.80	3.00
Y	0.6932	0.7885	0.8755	0.9555	1.0296	1.0986

Also compute the truncation error

8. Evaluate the integral $I = \int_0^{12} e^{-x^2}$ by (i) Trapezoidal rule (ii) Simpson's Rule. Take $h = 0.2$ Also estimate the error in the Trapezoidal rule

MC-311 ALGORITHMS DESIGN AND ANALYSIS

Time: 3:00 Hours

Max. Marks: 70

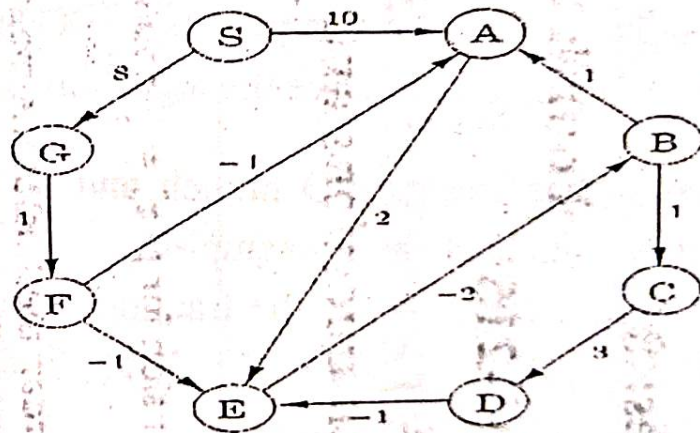
Note: Answer any five questions.
Assume suitable missing data, if any.

1)

- a) Explain the Big 'O' and Big 'theta' notation in the analysis of algorithms with the help of suitable examples. (7)
- b) What are recurrences? Explain different methods for solving a recurrence relation. (7)

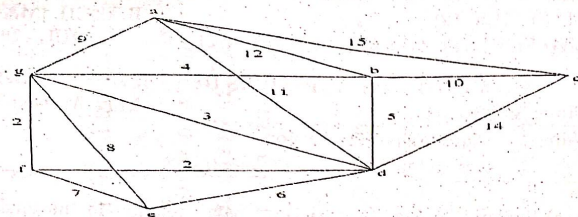
2)

- a) Write an algorithm for rod cutting problem using dynamic programming techniques. Analyze the algorithm and show how the asymptotic behavior is better than a recursive approach. (7)
- b) Explain Bellman-Ford algorithm for solving single-source shortest path problem and apply on the given graph? (7)



-25-

- 3) Write Kruskal's algorithm/pseudo code and find the minimum spanning tree for the given graph (Step by Step). (7)



b) What is topological sorting? Explain the algorithm with an example. (7)

a) Discuss matrix chain multiplication problem with reference to dynamic programming technique and also apply it on the following values of p_0, p_1, p_2, p_3 : (7)

3	2	3	2
---	---	---	---

4) a) Explain how backtracking is used for solving 4-queen problem? Show the state space tree. Extend the solution to be used for n-queen problem. (7)

b) Given two sequences $X=ABADABDC$ and $Y=BADCBAD$, find the longest common subsequence of X and Y using dynamic programming approach. Give the algorithm and show the steps. (7)

5) a) Differentiate between FIFO branch and bound and LIFO branch and bound with the help of example? (7)

b) Find an optimal solution to the fractional knapsack instance $n = 7$, $M = 15$, $(p_1, p_2, p_3, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, w_3, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ (7)

6) a) Write short notes on P, NP and NP-complete problems. (7)

b) Explain the Rabin-Karp method of string matching with examples. (7)

7) a) Solve the 0/1 knapsack problem using branch and bound. (7)

Total pages: 02

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SIXTH SEMESTER

B.Tech. Mathematics & COMPUTING

END SEMESTER EXAMINATION

July/Aug-2021

PAPER CODE: MC312 & TITLE: STOCHASTIC PROCESSES

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any seven questions.

All questions carry equal marks.

Assume suitable missing data, if any.

Q.1 What is a simple random walk. Give examples of random walk with
(i) Two absorbing barriers, (ii) One reflecting barrier.
Derive the equations depicting the walks.

Q.2 Show that in case of unrestricted simple random walk, if the probability of a jump upward is greater than the probability of a jump downward, then the particle will drift to ∞ with probability one.

Q.3 What is a Poisson process? Give example of homogeneous and non homogenous Poisson processes. Prove that sum of two independent Poisson processes is again Poisson. What about their difference?

Q.4 Describe a renewal process? How does it differ from a Poisson process? Consider a renewal process with renewal function as at , a being constant Find the probability distribution of the number of renewals by b time units.

Q.5 Explain Markov chain. By taking an example demonstrate how a steady state distribution is obtained in case of a Markov chain.

Cont.

Q.6 Suppose that in a specific city whether it rains today depends on previous weather conditions only from the last two days. Assume suitable probabilities as per your choice for all the four possibilities. Consider the system to be homogeneous and write it as Markov chain. Let it rained on both Monday and Tuesday; find the probability of rain on Thursday.

Q.7 What is birth and death process? The birth process in a city follows Poisson with rate 3 births per hour. Find, (i) expected number of births per month, (ii) the probability of no birth in an hour.

Q.8 Describe pure death process. Give two examples. Find its probability generating function.

Q.9 Describe M/M/c queuing system. Derive expression for expected number of customers in the queue.

Q.10 Define reliability. Find the reliability of a six components system when the components are in (i) series, (ii) parallel.

SIXTH SEMESTER
SECOND SEMESTER EXAMINATION

Roll No.:
B. Tech. [MC]

July, 2021

MC- 313, Matrix Computation

Time: 3.0 Hours

Max. Marks: 70

Note: Attempt Any two parts from each questions. All questions carry equal marks.
Assume suitable missing data, if any. Simple calculators are allowed.

1. (a) Discuss Rank deficiency and Numerical rank of a matrix.
 - (b) Show if A is a strictly diagonally dominant matrix, then the Gauss-Seidel iteration scheme converges for any initial starting vector.
 - (c) Obtain the least square solution of $Ax = b$, where $A = \begin{bmatrix} 0 & 1 \\ 3 & 0 \\ 0 & 2 \\ 4 & 10/3 \end{bmatrix}$
and $b = (1, 1, 1, 1)^T$
2. (a) Determine the QR decomposition of $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 1 & 1 \end{bmatrix}$ using Householder transformation.
 - (b) Determine the induced matrix norm of A using following vector norm
(a) $\|A\|_1$ (b) $\|A\|_\infty$
when $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$.
 - (c) Discuss Moore Penrose inverse with example.
3. (a) Let $A(\alpha) = \begin{bmatrix} 0.1\alpha & 0.1\alpha \\ -10 & -15 \end{bmatrix}$. Determine α such that condition number of $A(\alpha)$ is minimized. Use the maximum norm.

(b) Determine the smallest eigenvalue and the corresponding eigenvector of the matrix $\begin{bmatrix} 4 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 4 \end{bmatrix}$ correct upto 3 decimal places using the power method.

(c) Define and derive the formula for spectral radius of a matrix A .

4. (a) Prove that for a system $Ax = b$, A is a $m \times n$ matrix, $(A^T A)$ is non-singular if A has full rank.

(b) Transform the matrix $\begin{bmatrix} 2 & 1 & -2 \\ -3 & 1 & 0 \\ 4 & 3 & 1 \end{bmatrix}$ to the Hessenberg form.

(c) Find the singular value decomposition of the matrix $\begin{bmatrix} 1 & -4 \\ -2 & 2 \\ 2 & 4 \end{bmatrix}$.

5. (a) Define generalized eigen vectors and find the generalized eigen vector for the matrix $\begin{bmatrix} 2 & 2 & 3 \\ 1 & 3 & 3 \\ -1 & -2 & -2 \end{bmatrix}$

(b) Find QR factorization for the matrix (using Gram-Schmidt process)

$$\begin{bmatrix} 1 & 1 & 4 \\ 1 & 4 & 2 \\ 1 & 4 & 2 \end{bmatrix}$$

(c) Prove that each eigen value of a square matrix A lies in at least one Gerschgorin's disk generated by A .

Roll No.
No. of Pages : 4
Also, check whether converse of the above result holds or not.

Also, check whether converse of the above result holds or not.

[c] What is an ambiguous grammar? Is the grammar with production rules as given below ambiguous?

No. of Pages : 4

Roll No.

SIXTH SEMESTER

D.Toch.I MC OLD SCHEME 1

END SEMESTER EXAMINATION

July/Aug-2021

MC314 & THEORY OF COMPUTATION

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any two parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 [a] Differentiate between Deterministic and Non-deterministic automata. Convert the NFA below to an equivalent DFA.

State/ Σ	a	b
$\rightarrow q_0$	q_0, q_1	q_0
q_1	q_2	q_1
q_2	q_3	q_3
q_3		q_2

[b] Construct a DFA with reduced states equivalent to the regular expression $10+(0+11)0^*1$

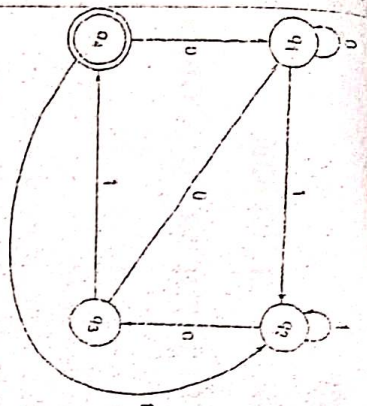
[c] Define Chomsky Classification of languages. Construct a regular grammar to generate with.

Q.2 [a] State and prove Arden's Theorem.

[b] Reduce the following grammar to Chomsky Normal Form.

$S \rightarrow aAD; A \rightarrow aB|bAB; B \rightarrow b; D \rightarrow d$

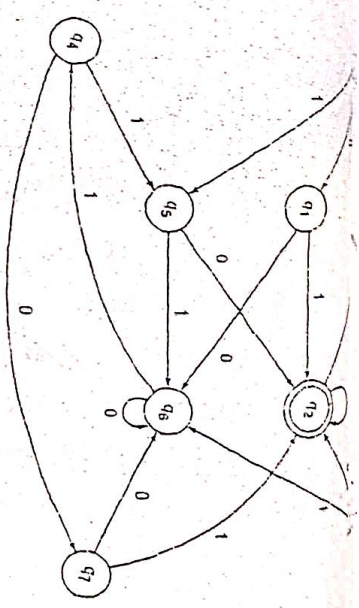
P.T.O.



Q.3 [a] Differentiate between Mealy and Moore machine. Construct a Mealy machine equivalent to the Moore machine below:

Present state	Next state		Output
	a = 0	a = 1	
→q ₀	q ₁	q ₂	1
q ₁	q ₃	q ₂	0
q ₂	q ₂	q ₁	1
q ₃	q ₀	q ₃	1

- [b] Construct a reduced grammar equivalent to the grammar given below:
 $S \rightarrow aAa$; $A \rightarrow Sb|bCC|DaA$; $C \rightarrow abb|DD$; $E \rightarrow aC$; $D \rightarrow aDA$
- [c] State and prove Pumping Lemma for regular sets.
- Q.4 [a] Minimize the automata given below:



- [b] Construct a pushdown automata A equivalent to the CFG given by:
 $S \rightarrow 0BB, B \rightarrow 0S|1S|0$. Also, test whether 010000 is in $N(A)$.
- [c] Prove that if is a pda accepting a CFL by empty store, we can find a pda which accepts by final state i.e..

Q.5 [a] Define a Turing machine. Draw the computation sequence of the input string 00 for the Turing machine given below:

Present state	Tape symbol	
	0	1
→q ₁	1Lq ₂	0Rq ₁
q ₂	bRq ₃	0Lq ₂
q ₃	0Rq ₃	bRq ₄
q ₄	0Lq ₃	1Rq ₄
q ₅		

[b] Prove that if $(q, x, a) \vdash^* (q', A, y)$, then for every β in Γ^*
 $(q, x, a\beta) \vdash^* (q', A, y\beta)$

Total No. of Pages: 2
Semester - VI
End Semester Examination

Roll No.....
B. Tech. (MC)
(July 2021)

MC-315(Old Scheme): Operating System

Time: 3 Hours

Max. Marks: 70

Instructions: Write neatly. Assume suitable missing data, if any?

Q1. Answer any 7 of the following

7*5

- Describe the purpose of Operating System.
- Differentiate between Multiprogramming and Multiprocessing Operating System.
- What is a Process Control Block and why it is required?
- Explain the 5-state process life cycle.
- Explain the concept of Pure demand Paging.
- State and explain the necessary conditions to achieve a deadlock?
- What is the difference between logical address space and physical address space?
- What is Belady's Anomaly?
- What is starvation in Operating System? How it is solved?

Q2.

10+10

a. Consider three process, all arriving at time zero, with total execution time of 10, 20 and 30 units respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be

overlapped as much as possible. For what percentage of does the CPU remain idle?

b. A system shares 9 tape drives. The current allocation and maximum requirement of tape drives for three processes are shown below:

Process	Current Allocation	Maximum Requirement
P1	3	7
P2	1	6
P3	3	5

Is the state of the system safe?, Is the system in deadlock state?

Q3. Write a short note on any three of the following.

5+5+5

- a. Semaphores
- b. FCFS scheduling method
- c. Paging
- d. fragmentation

~End~

Total No. of Pages 02

Roll No.

EIGHTH SEMESTER
END TERM EXAMINATION
JULY-2021

B.Tech.[MC]

MC-411 MATHEMATICAL MODELING AND SIMULATIONS

TIME: 3:00 Hours

Max. Marks: 70

Note: Answer any Five Questions. All Questions Carry Equal marks.

Assume suitable missing data, if any.

Q.1 (a) Prove that be the *distribution function* of the continuous random variable X , and let have uniform distribution on . Then the (implies $F(x)=u$) has the *d.f.*, hence generate a sample of the random variable X uniformly distributed in (a,b) having p.d.f

(7)

(b) Discuss the Monte Carlo approach to evaluate the integral of function in using random numbers.

(7)

Q. 2 Discuss the linear and non-linear population growth and decay model for bacteria — population:

(14)

Q.3 Find all equilibrium solutions of the system of differential equations

and determine (if possible) whether they are stable or unstable

(14)

Q.4 Obtain the cubic spline fit for the data

x	0	1	2	3
f(x)	1	2	33	24
				4

under the end conditions

(14)

Q.5(a) Explain and solve the Susceptible-infected (SI) and susceptible-infected-recovered (SIR) model for an epidemic. (7)

(b) Discuss the non-linear prey predator model and also stability. (7)

Q. 6 In the following data, W represents the weight of bass, l represents its length and g its girth

Length (in in.) l	14.5	12.5	17.25	14.5	12.625	17.7	14.12	12.62
Girth (in in.) g	9.7	8.37	11.0	9.7	8.5	12.5	9.0	8.5
Weight (in oz.) W	27	17	41	26	17	49	23	16

Use the least - squares criterion to find the models of the following types:

- i. ii. .

Determine which model fits the data better.

(14)

Pages: 2

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VIII Semester
End Semester Examination
Paper Code: MC-412-1
Max Marks: 70

Roll No.:
B.Tech., July/August-2021
Optimization Techniques
Time: 3 Hours

NOTE: Answer any three question. All questions carry equal marks. Assume suitable missing data if any.

Q 1. For the QPP in the form $\text{Max } c^T x + x^T Q x$ subject to $Ax \leq B, x \geq 0$; We have the following KKT conditions.

$$\begin{pmatrix} 1 & -2 & 2 & -1 & 0 & 0 \\ -1 & 4 & 1 & 0 & -1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ \lambda \\ \mu \\ \nu \\ s \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \\ 0 \end{pmatrix}$$

$$x_1, x_2, \lambda_1, \mu_1, \mu_2, s_1 \geq 0; \lambda_1 s_1 = \mu_1 x_1 = \mu_2 x_2 = 0$$

(a) Write the QPP being solved.

(b) check whether the above optimization problem is solvable or not. Justify your answer.

Q 2. (a) Apply Lagrange Multiplier Method to solve the following optimization problem.

$$\text{Max } Z = x^2 + y^2$$

subject to:

$$-2x + x_2 = 4$$

$$x_1 + x_2 + x_3 - 1 = 0$$

(b) Is the following convex optimization problem? Justify your answer.

$$\text{Min } f(x) = \text{Max}(x^2, (x-2)^2, 4)$$

subject to:

$$(x-2)^2 \leq 5$$

$$0 \leq x \leq 5$$

Q 3. (a) Let $f: R^n \rightarrow R$ be a convex function and S be a convex set in R^n . If x_0 is a local minimum of f over S then prove that it is global minimum.

(b) Explain briefly Charne's and Cooper method to Solve fractional programming problem and solve the following Stock Cutting Problem of minimizing the ratio of waste material and the used amount of raw material. $\text{Max } Z = \frac{2x}{x+2y+1}$

subject to:

$$2x + y \leq 4$$

$$x - 2y \leq 1$$

$$x, y \geq 0.$$

P.T.O

Q 4. Use Barrier Method solve the Optimization Problem given as: $\text{Min}Z = x_1^3 + 3x_1^2 + 2x_1 + x_2 + \frac{1}{3}$
subject to:

$$1 - x_1 \leq 0$$

$$x_2 \geq 0$$

Q 5. Solve the following Optimization Problem using Kuhn-Tucker Conditions:

$$\text{Min}Z = 2x_1 + 3x_2 - x_1^2$$

subject to:

$$2x_1 + 3x_2 \leq 6$$

$$2x_1 + x_2 \leq 4$$

$$x_1, x_2 \geq 0.$$

Total No. of Pages 2

**FOURTH SEMESTER
END SEMESTER EXAMINATION**

Roll No.

B.Tech. (EP)

(July-2021)

EP- 211 Classical & Quantum Mechanics (Old Scheme)

Time: 3:00 Hours

Max. Marks: 70

Note: Q 1 is compulsory and attempt Six questions from remaining. All questions carry equal Marks. Assume suitable missing data, if any.

Q 1 a) Prove the statement, "A function whose Poisson bracket with Hamiltonian vanishes is a constant of motion".

OR

Calculate the eccentricity of the orbit in terms of maximum ' v_{\max} ' and minimum ' v_{\min} ' velocities of a satellite.

b) The wave packet for 1-D motion of a free particle of mass m is,

Show that it is properly normalized.

c) A linear harmonic oscillator is in the first excited state ($n=1$). At what point is its probability density maximum? What is the value of maximum probability density?

d) Write down the Lagrange's equation of motion for a particle of mass ' m ' falling freely under gravity near the surface of earth.

2 a) If x and p_x are the coordinates and momentum operators, prove that

=

b) State Ehrenfest theorem. Show that the average motion of a wave packet corresponding to a particle of mass m satisfies the equation

3 a). What is d'Alembert's principle? Derive Lagrange's equation of motion from it.

b). Explain the concept of Phase Space. Obtain the Hamiltonian and Hamilton's canonical equations for the motion of a non-relativistic charged particle of mass ' m ', charge ' q ' in an electromagnetic field.

Q 4 a) Explain orthogonality and orthonormality of a wave function. Prove that $\int \psi_m^* \psi_n dx = 0$, where ψ_m and ψ_n are the solutions of one dimensional time independent Schrodinger wave equation for energy values E_m and E_n ($E_m \neq E_n$).

b) Explain probability density. Calculate the probability density $J(x)$ for the wave function $\Psi(x) = u(x) \exp[i\phi(x)]$

Q 5 a). Discuss the motion of a particle under a central attractive force inversely proportional to the square of the distance from the center of force field. Discuss the nature of orbits.

b). Discuss the stability condition for the central force field if the form of potential $V(r)$ is ar^{-1} , a being a constant and centrifugal energy is $V_c(r)$ is br^2 , being positive constant.

Q 6 a). Find the value of angular momentum operator in spherical polar coordinates. Hence determine whether or not $\sin(m\phi)$ is its eigenfunction.

b). What ratio of V_0 is necessary for scattering from a 1-D step potential, so that the transmission probability is 50%?

Q 7 a). Consider the infinite square well defined by $V(x) = 0$ for $0 \leq x \leq a$
 $= \infty$ otherwise.

Using the first order perturbation theory, calculate the energy of the first state ($n=1$) of the potential well if a portion defined by $V(x) = V_0$ where V_0 is a small constant, with $0 \leq x \leq a$ being sliced off.

b). A system in an unperturbed state n is suddenly subjected to a constant perturbation $H'(r)$ which exists during $0 \rightarrow t$. Find the probability for transition from state n to state k and show that it varies simple harmonically with angular frequency and amplitude.

Q 8 Write notes on:

- i) Connection Formula in WKB Approximation
- ii) Unbound motion: Rutherford scattering

END

Total No. of Pages: 3

FOURTH SEMESTER

END SEMESTER EXAMINATION

EP-212 OPTICS

[OLD SCHEME]

Roll No.

B.Tech.(EP)

(July.-2021)

Time: 3 hrs

Max. Marks: 70

Note: Answer any seven questions.

1. (a) Draw a neat diagram showing the optical arrangement of a Michelson interferometer.
- (b) Draw a neat ray diagram showing the production of interference pattern by Fresnel two mirror experiment.
- (c) Plot the function 'Sin² Nγ / Sin² γ' for N = 7.
- (d) Derive an expression for cosine law.
- (e) It is not possible to show interference effects between light from two separate sodium vapour lamps but you can show interference effects between sounds from loudspeakers that are driven by separate oscillators. Explain why it is so.

[2*5=10]

2. Assume a Gaussian pulse of the form

$$\psi(x=0, t) = E_0 \exp\left(-\frac{t^2}{2\tau^2}\right) e^{i\omega_0 t}$$

Find the Fourier transform $A(\omega)$. Show that the temporal coherence is $\sim \tau$. Assume $\tau \gg (1/\omega_0)$, plot the Fourier transform $A(\omega)$ [as function of ω] and interpret it physically. Show that the frequency spread $\Delta\omega \sim 1/\tau$.

Following standard integral can be used:

$$\int_{-\infty}^{\infty} \exp[-\alpha x^2 + \beta x] dx = \sqrt{\frac{\pi}{\alpha}} \exp\left(\frac{\beta^2}{4\alpha}\right); \quad \alpha > 0$$

[10]

P T O

3. (a) Consider a plane wave of wavelength 6×10^{-5} cm incident normally on a circular aperture of radius 0.01 cm. Calculate the position of the brightest and the darkest points on the axis.

(b) What would happen if a circular disc of the same radius replaces the circular aperture?

[6, 4]

4. (a) Explain the working principle of Fabry Perot interferometer.
(b) Show that the figure of merit of the Fabry Perot cavity is the ratio of the separation between transmittance peaks to the full width at half maximum.

(c) A Fabry Perot interferometer has a 1 cm spacing between the mirrors and a reflection coefficient of $r = 0.95$. For a wavelength around 500 nm, determine its mode number, its finesse, figure of merit, its minimum resolvable wavelength interval, and its resolving power.

[3, 2, 5]

5. (a) Consider a diffraction grating of width 5 cm with slits of width 0.0001 cm separated by a distance of 0.0002 cm. What is the corresponding grating element? How many orders would be observable at $\lambda = 5.5 \times 10^{-5}$ cm? Calculate the width of the principal maximum. Would there be any missing orders?

(b) Consider a Gaussian beam with $\lambda = 0.5 \mu\text{m}$. Calculate the spot size of the beam at $z = 10$ m for $w_0 = 0.25$ mm; here w_0 represents the spot size at $z = 0$ where the phase front is plane. Interpret the result physically.

[5+5]

6. Describe Fraunhofer's diffraction due to a single slit and deduce the positions of the maxima and minima. Show that the relative intensities of successive maxima are nearly $1 : 1/22 : 1/61 : \dots$. What will happen if the width of the slit is made equal to the wavelength of light?

[10]

7. Analyze using Fresnel integrals the diffraction of a plane wave incident normally on a long narrow slit. Further analyze the transition of Fresnel diffraction to Fraunhofer diffraction.

[10]

8. Explain Cornu's spiral. Analyze the Fresnel diffraction at a straight edge using Cornu's spiral. Also sketch the intensity pattern.

[10]

ORIGINAL

Total No. of Pages 2

FOURTH SEMESTER

END SEMESTER EXAMINATION

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Roll No.

B.Tech. [EPI]

(July-2021)

EP- 213 SIGNALS AND SYSTEMS

Time: 3.0 Hours

Note: Attempt ALL questions.

Max. Marks: 70

Each question carry equal marks

Assume suitable missing data, if any

- Using shifting property of unit impulse signal find the output $y(t)$.
 $y(t) = 4t^2 \delta(2t - 4)$
(a) $y(t) = 4 \cos\left(\frac{\pi}{4}\right) t \delta(2t - 8)$
(b) $y(t) = 4 \cos\left(\frac{\pi}{4}\right) t \delta(2t - 8)$
- Give the comments on static/dynamic, causality, linearity, and time variance of the following signals- $y(t) = 4 + x(t)$
- Find the convolution of given signals-
(a) $x(t) = u(t)$, $h(t) = u(t)$
(b) $x(t) = u(t - 2)$, $h(t) = u(t)$

OR

Find the initial and final values of given transfer function

$$X(s) = \frac{2s + 6}{s(4s + 2)}$$

- Consider a periodic signal $x(t)$ with fundamental period $T=8$ and $a_1=j$, $a_2=-j$, $a_3=a_5=2$. Find the continuous time Fourier series.
- Find the fundamental period N of the signal $x[n] = 1 + e^{j\left(\frac{4\pi}{7}\right)n} - e^{j\left(\frac{2\pi}{5}\right)n}$.
- State the Sampling Theorem. Explain aliasing, decimation, and interpolation.
- Consider a discrete time signal $x(n)$ given by $x(n) = \{-1, 0, 1, 2, 1, 0, 1, 2, 1, 0, -1\}$. Calculate-
(i) $\int_{-\pi}^{\pi} X(e^{j\omega}) d\omega$
(ii) $\int_{-\pi}^{\pi} |X(e^{j\omega})|^2 d\omega$
- Write the properties of ROC of Laplace transform with examples.
- Perform the circular convolution of the following two sequences with circular diagram-

- 114 -

$$x_1(n) = \{2, 1, 2, 1, \}$$

$$x_2(n) = \{1, 2, 3, 4, \}$$

10. Find the DFT $X(k)$ of $x(n) = \{1, 2, 3, 4, \}$.

11. Find the convolution of $x[n] = \{3, 1, 4, \}$ and $h[n] = \{4, 0, 5, 2, \}$.

12. Find the inverse Laplace transform of

$$X(s) = \frac{2 + 2s.e^{-2s} + 4e^{-2s}}{s^2 + 4s + 3} \quad \text{Re}(s) > -1$$

13. Using power series expansion technique, find the inverse z-transform of the following $X(z)$

$$X(z) = \frac{z}{2z^2 - 3z + 1} \quad |z| > 1$$

14. Let $x(t) = e^{-2|t|}$ and $x_1(t) = x(2t - 3)$, Calculate $X_1(\omega)$.

**FOURTH SEMESTER
END SEMESTER EXAMINATION**

ORIGINAL

Roll No.

B.Tech. (EP)

July-2021

EP-214 MICROPROCESSORS AND INTERFACING

Time: 3 Hours

Max. Marks : 70

Note : Attempt seven questions in all. All questions carry equal marks. Assume suitable missing data, if any.

- Q.1. (a) In Mode 3 of 8253, if the initial count loaded in the counter is odd, for how many counts does the output remain high and low? Explain the mechanism of pipelining in 8086 Microprocessor. [5]
- (b) Explain the 3 modes of operation in 8255. Also describe the control word format of I/O Mode in 8255. [5]
- Q.2. (a) Explain the use of the following instructions in 8086:
(i) CMC
(ii) DAA
(iii) XCHG
(iv) NEG
(v) RCR [5]
- (b) Explain 2 signals each in 8086 microprocessor when operating in a minimum mode and maximum mode. Explain the 3 types of program memory addressing modes giving an example of each. [5]
- Q.3. (a) Explain the mechanism of pipelining in 8086 Microprocessor. Also differentiate between the Minimum and Maximum Modes of Operation. [5]
- (b) Discuss, with example, the modes of addressing and status bits affected by the following instructions in PIC-16F877:
(i) incfsz, (ii) bsf, (iii) clrwtd, (iv) retfie and (v) sleep [5]
- Q.4. (a) Suppose a hardware interrupt vector 32 is in progress. Which all interrupt vectors can suspend its processing? Why should an interrupt vector have 4 bytes? Determine the ISR address for a hardware interrupt vector type 32. [5]

(b) Generate a 20-bit physical address if CS=2579H and IP=0045H. The contents of memory location B0000₁₆ are FF₁₆, those at B0001₁₆ are 00₁₆ and AB₁₆ at B0002₁₆. What is the odd-addressed data word stored at address B0001₁₆. [5]

Q.5. (a) Write an assembly language program in 8086 to generate the Fibonacci series less than FFH. [5]

(b) Briefly explain the timing diagram of I/O and Memory Read Bus Cycle in 8086 indicating the status of all relevant bus signals. [5]

Q.6. (a) Explain the operation of 8257 using a block diagram. Differentiate between the block transfer DMA and cycle-stealing DMA. [5]

(b) Write an 8086 assembly language program to evaluate the expression $z=2a+2b+2c$. [5]

Q.7. (a) Write a program to generate a delay of 10 milliseconds and using an 8086 system that runs on 5 MHz frequency. [5]

(b) Explain the term handshaking signals as it applies to computer I/O devices. Describe the use of CAS0, CAS1 and CAS2 lines in a system with a cascaded 8259s. [5]

Q.8. (a) Interface DAC with 8086 running at 8MHz based on 8255 and write an assembly language program to generate a triangular waveform of period 1ms with $V_{max}=5V$. [5]

(b) What is REP prefix? How it functions for string instructions? Explain the Specific Rotation Mode of Programmable Interrupt Controller. [5]

END

Total No. of Pages: 2

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Roll No.
B.Tech. [EP]

**FOURTH SEMESTER
END SEMESTER EXAMINATION**

(July-2021)

EP-215 COMPUTATIONAL METHODS

Max. Marks: 70

Time: 3 Hours

Note : Answer any five questions.
Assume suitable missing data, if any.

1. (a) Derive the general formula to find out the maximum permissible error. Explain the same by taking a suitable example. [7]
(b) Use three iterations of Newton's Method to find out the root of the equation $e^x - 4x = 0$ Take $x_0 = 2.1$. [7]
2. (a) Prove that $(y_1 - y_0) - x(y_2 - y_1) + x^2(y_3 - y_2) - \dots \pm \dots \pm \infty = \frac{\Delta y_0}{1+x} - x \frac{\Delta^2 y_0}{(1+x)^2} + x^2 \frac{\Delta^3 y_0}{(1+x)^3} - \dots \pm \dots \pm \infty =$ [7]
(b) Using Newton's forward interpolation formula, find out the estimated population of town in year 1923. [7]

Year (x)	1911	1921	1931	1941	1951	1961
Population (y in thousands)	12	15	20	27	39	52

3. (a) The table given below reveals the velocity V of a body during the time t . Find the acceleration of the body at $x = 1.1$ meter [7]

x (meter)	1.0	1.1	1.2	1.3	1.4
V (meter/sec)	43.1	47.7	52.1	56.4	60.8

- (b) Draw the difference table and derive the Stirling's formula. [7]

4. (a) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x + y) dx dy$ using trapezoidal rule. (Take $h = k = \pi/4$). [7]

(b) The velocity V of a scooter which start from rest is given at fixed intervals of time t as follows [7]

t (min)	2	4	6	8	10	12	14	16	18	20
V (km/min)	10	18	25	29	32	20	11	5	2	0

Estimate the distance covered in 20 minutes by Simpson's 1/3 method.

5. (a) Solve $\frac{dy}{dx} = 1 + xy; y(0) = 1$ and find the value of y at $x = 0.1$ & 0.2 using third approximation of Picard's method. [7]

(b) Write a Matlab code to solve any Simultaneous first order differential equation by fourth order Runge-Kutta method. [7]

6. Write Matlab code for any two of the following numerical methods [14]

(a) Bisection method

(b) Double integration by Simpson's 1/3 method.

(c) Newton Raphson method

EP-216: CONDENSED MATTER PHYSICS

Time: 3:00 Hours

Note: Answer any SEVEN questions

Max. Marks: 70

Assume suitable missing data, if any.

- (a). Discuss about Miller indices. Draw the planes: (111) and (210) in a simple cubic (SC) structure. [5]
- (b). What is Bragg's law? Derive the Bragg's law of diffraction of X-rays by a crystal. [5]
- (a). Briefly, explain various kind of possible surface defects in solids. [5]
- (b). Explain the Fermi-Dirac distribution function of electrons. Illustrate graphically the effect of temperature on this distribution and define Fermi level. [5]
- (a). An electron is confined in the ground state of a 1-D box of width 10^{-10} m. Calculate the energy of the electron in its ground and first excited state? ($m_e = 9.1 \times 10^{-31}$ kg and $h = 6.626 \times 10^{-34}$ J-s) [5]
- (b). Explain superconductivity. Show that Meissner effect is inconsistent with Maxwell equation. [5]
- (a). Derive London equations and discuss how do they help in explaining the superconducting state. [5]
- (b). What is lattice vibration? Derive expression for frequency of mono-atomic (1-D) string of atoms and hence find out dispersion relation of frequency. [5]

- 5(a). What is electronic polarization? Derive expression for magnetic moment, electronic polarizability and susceptibility. [5]
- (b). Find the total polarizability of CO_2 , if its susceptibility is 0.985×10^{-10} . Density of carbon dioxide is 1.977 kg/m^3 . [5]
- 6(a). What is diamagnetism? Derive the expression for diamagnetic susceptibility using Langevin's theory. [5]
- (b). What are the failure of Langevin's theory of Para-magnetism? Discuss Weiss theory for paramagnetic materials and derive expression for paramagnetic susceptibility. [5]
- 7 (a). Explain ferromagnetism using domain wall / Bloch wall theory. How magnetic storage takes place through magnetostriction? [5]
- (b). Explain giant magnetoresistance (GMR). Explain the working mechanism of GMR with suitable spin transport diagram. Write any two applications of GMR. [5]
8. Answer any **FOUR**. [2.5x4 = 10]
- (a). Dielectric loss
 - (b). Ferrites
 - (c). Type -II superconductors
 - (d). Cooper pair
 - (e). Internal magnetic field
 - (f). Ionic polarization

END SEMESTER EXAMINATION

July/Aug-2021

PAPER CODE-EP-311 (old scheme) & TITLE OF PAPER- Instrumentation & Control

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any five questions. All questions have equal marks.

Assume suitable missing data, if any. Where symbols have their usual meaning

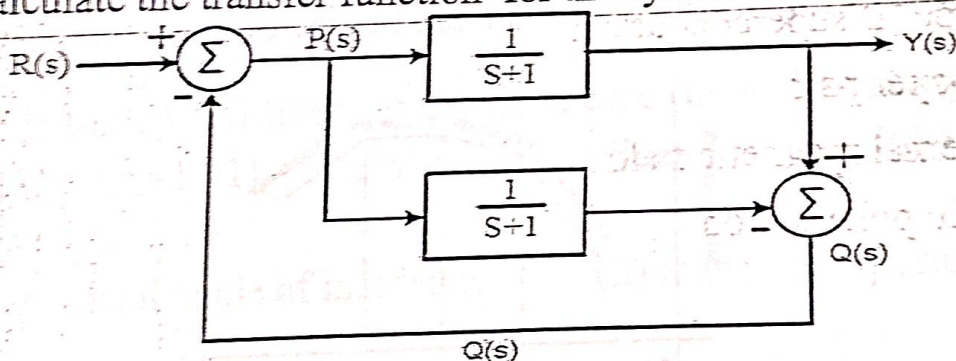
1. (a). What are the standard test signals employed for the time domain studies? Describe in details the time response of the first order system when subjected to different standard signals.

(b). Explain the term "time response of a system". Describe transient response and steady state response.

Q.2 (a) Write short notes on Hall Effect transducer and smart sensors. Also discuss about their working principle and applications.

(b) Explain the strain gauge and its working theory? What are their advantages and disadvantages?

Q.3 (a) Calculate the transfer function for the system shown below



(b). Explain Manson's Gain Formula.

Q.4 (a) Find the sensitivity S_K^T of the transfer function $T = \frac{1+2K}{3+4K}$ with respect to the parameter K.

(b) The closed loop transfer function of a unity feedback control system is given by:

$$C(s)/R(s) = (Ks+b)/(s^2+as+b)$$

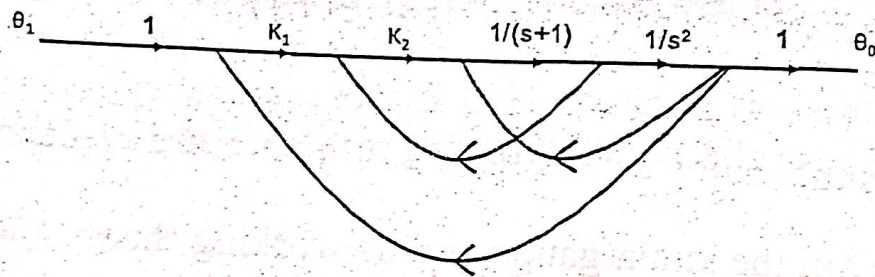
Determine the steady state error for unit ramp input.

- Q.5 (a) A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subjected to a stress of $100 \times 10^6 \text{ N/m}^2$. The modulus of elasticity of steel is $200 \times 10^9 \text{ N/m}^2$. Calculate the percentage change in the value of the gauge resistance due to the applied stress. Comment upon the results.

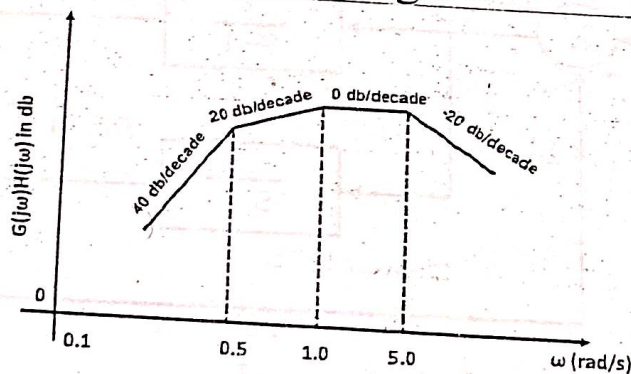
Given that Gauge factor =

- (b) Describe differential output and its advantages.

6. (a) A system represented by the signal flow graph as shown in figure. The variable T is the torque and E is the Error the determine (i) the overall transfer function, if $K_1 = 5$, $K_2 = 1$ and $K_3 = 5$. (ii) The sensitivity of the system to changes in K_2 for $\omega = 0$.



- [b] Determine the open loop transfer function $G(s)H(s)$ of a feedback control system whose Bode-plot's magnitude characteristics is shown in the figure.



Total No. of Pages : 2

SIXTH SEMESTER

END SEMESTER EXAMINATION

EP- 312 FIBER OPTICS & OPTICAL COMMUNICATION
(OLD SCHEME)

Roll No.

B.Tech. [EP]

(JULY 2021)

Time: 3:00 Hours

Max. Marks: 70

Note :

Answer all questions.

Assume suitable missing data, if any.

1. Using boundary Conditions for a TM wave derive the eigenvalue equation for a planar symmetric step index waveguide. Discuss the graphical method to find its solution.

[10]

2. Discuss the major transmission losses that take place in an optical fiber.

[10]

3. (a) Consider a 30-Km long optical fiber that has an attenuation of 0.4dB/Km at 1310 nm. Find the optical output power P_{out} if 200 μ W of optical power is launched into the fiber.

(b) For the optical fiber having glass core ($n_1 = 1.5$) and quartz cladding ($n_2 = 1.41$), determine the values of the following parameters:

(i) the critical angle of incidence (ii) numerical aperture

(iii) the acceptance angle

(c) The band gap of a semiconductor material used for fabrication of a laser diode is specified as 1.3 eV. Find the emission wavelength.

[4,3,3]

4. (a) Differentiate between light guidance in optical fibers with skew rays and meridional rays. Illustrate the ray paths for both.
(b) Explain any one method of fiber fabrication.
(c) Sketch the transverse modal field patterns for LP_{01} , LP_{11} and LP_{21} modes in an optical fiber. [4,3,3]
5. Obtain the expression for waveguide dispersion in optical fibers. [10]
6. (a) What is threshold gain? Obtain expression for threshold gain in a laser diode.
(b) Outline and elaborate the techniques that are adopted to obtain line width narrowing in semiconductor laser diodes. [6,4]
7. (a) Explain the principle of operation of a PIN photodiode and hence establish the relation between responsivity and quantum efficiency of a photodiode.
(b) The forward current through a GaAsP red LED emitting at 670 nm wavelength is 30 mA. If the internal quantum efficiency of GaAsP is 0.1, what is the optical power generated by the LED? [6,4]

Total No. of Page: 1
SIXTH SEMESTER
END SEMESTER EXAMINATION
EP 314 : MICROWAVE ENGINEERING
Time : 3.00 Hrs
Note : Attempt all Questions
Assume suitable missing data, if any

Roll No.....
B.Tech. (Engineering Physics)
July 2021
Max. Marks : 70

- 1 (a) What is a slow wave structure? With the aid of a schematic diagram, describe the traveling wave tube (TWT). (8)
- (b) Derive the expressions for the Hull cutoff voltage and Hull cutoff magnetic field of a cylindrical cavity magnetron. An X-band pulsed cylindrical magnetron has the following operating parameters : Anode voltage $V_0 = 26\text{kV}$, beam current $I_0 = 27\text{A}$, magnetic flux density $B_0 = 0.336\text{Wb/m}^2$, radius of cathode cylinder $a = 5\text{cm}$, radius from the center of the cathode to the edge of the anode $b = 10\text{cm}$. Determine (i) the cyclotron angular frequency (ii) the cutoff voltage for a fixed B_0 (iii) the cutoff magnetic flux density for a fixed V_0 . (4)
- (c) Differentiate between variable and fixed type attenuators. (2)

OR

- 1. Write short technical notes on the followings (14)
 - (i) Gyrotron (ii) Faraday rotation (iii) Circulator (iv) Microwave oven
- 2(a) What is directional coupler? Define coupling factor and Directivity of a directional coupler. (8)
- (b) The input power in a two-hole directional coupler is 2 mW. The coupler has a coupling factor of 25 dB and a directivity of 30 dB. Calculate the power in all the ports. (6)
- 3(a) What are S-parameters? Derive the S-matrix of a directional coupler. (8)
- (b) Explain the J-E characteristics of Gunn diode with the help of two valley model theory. Discuss the applications of Gunn diode. A typical n-type GaAs Gunn diode has the following parameters : Threshold field $E_{th} = 2800\text{ V/sec}$, applied field $E = 3200\text{ V/sec}$, device length $L = 10\mu\text{m}$, doping concentration $n_0 = 2 \times 10^{14}\text{ cm}^{-3}$, operating frequency $f = 10\text{GHz}$. Determine : (i) the electron drift velocity (ii) the current density. (6)
- 4 (a) Describe the two-cavity Klystron amplifier, with the aid of a schematic diagram. Make a clear distinction between velocity modulation and current modulation, and explain how current modulation is necessary if the tube is to have significant power gain. (8)
- (b) What are the applications and limitations of the reflex Klystron? (6)
- 5(a) Differentiate between E-plane tee and H-plane tee junctions. (4)
- (b) Explain how a tunnel diode can be used as a negative resistance amplifier. (4)
- (c) What is 'Mode Jumping' in a cavity magnetron? What remedial steps can be taken to prevent the same? (6)

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Roll No.

Total No. of Pages: 1

SIXTH SEMESTER

END SEMESTER EXAMINATION

EP-315: FABRICATION AND CHARACTERIZATION OF
NANOSTRUCTURES

B.Tech. [EP I

July - 2021

Max. Marks: 70

Time: 3:00 Hours

Note: Answer ALL questions.

Assume suitable missing data, if any.

1. i) What are different methods for synthesis and preparation of nanostructures? Explain in detail? Mention top-down and bottom-up approaches with suitable examples of the materials and nanostructures? 07
ii) How can we make sure that all the calculations made in XRD are accurate? Mention at least two possible precautions? Elaborate on the type of image disturbances that occur while imaging specimens in SEM? 07
2. i) Draw schematic diagram of SEM and explain its various components in detail along with Electron beam specimen interactions? 07
ii) Which technique is widely used for the production of Nanostructures? How quantum confinement and its effects play a significant role in materials' electrical properties? 07
3. Explain any **FOUR** from the following: 14
 - a) Schematic diagram of AFM and its comparison with SEM in terms of resolution
 - b) Difference among 1D, 2D and 3D structures
 - c) Raman spectroscopy
 - d) Vacuum system and its role in SEM
 - e) Lithographic and Non-lithographic techniques
4. i) Explain the difference between CVD and Plasma Enhanced Chemical Vapour Deposition (PECVD) system? Draw schematic design of a thermal CVD system with tube furnace and its working? 07
ii) Do the properties of the materials size independent? Comment on it? Show schematic diagram of Transmission Electron Microscopy (TEM) and explain the difference of TEM with HRTEM in terms of resolution with proper example? 07
5. i) What is XRD? Draw the schematic diagram along with different geometries? What information can be extracted from XRD pattern? Explain in detail? How do we measure the particle size? Mention the wavelength of X-rays and clearly explain "why X-rays are used in XRD?" 07
ii) "Why does the sample size has to be small in TEM?" Explain? What are the limitations of light-optical microscopy? 07

END SEMESTER EXAMINATION

July-2021

EP-411 VLSI AND FPGA DESIGN SYNTHESIS

Time: 3:00 Hours

Max. Marks : 70

Note : Assume suitable missing data, if any. All questions carry equal marks. Attempt any SEVEN questions in all.

Q.1.(a) Explain how interconnect spacing and subthreshold current puts a limit on the device scaling? 5

(b) An enhancement PMOS transistor has $K(W/L) = 40\mu A/V^2$ and $V_t = -1.5V$. The gate is connected to ground and the source to +5V. Find the drain current for $V_d = +5V$ and $0V$. 5

Q.2.(a) Explain graphically, in detail, the $I_{DS}-V_{GS}$ and $I_{DS}-V_{DS}$ characteristics of NMOS. 5

(b) Explain the types of programmable interconnect in FPGA. Discuss the Fuse, Anti-fuse and SRAM based programming technology in FPGA. 5

Q.3.(a) Explain the soft error failures in DRAM. How do you prevent the occurrence of these soft errors? 5

(b) Explain the charge storage mechanism in a Floating Gate EPROM Cell along with its structural diagram. 5

Q.4. Describe the constant voltage scaling effect on the following parameters:

- Gate Delay
- Switching Energy
- Parasitic Capacitance
- Supply Voltage
- Channel Resistance

Q.5.(a) Define the following:

- (i) DIBL,
- (ii) Punchthrough,
- (iii) Noise Margin,
- (iv) Super Buffer and
- (v) Transit Time

(b) Design a stick-layout based nMOS transistor and a CMOS inverter. 5

Q.6.(a) Derive the input voltage expression for a CMOS inverter in terms of applied voltage, threshold voltage and geometrical parameter. 5

(b) Obtain a pull-up to pull down ratio when an n-MOS inverter is driven by another n-MOS inverter. Assume the default logic voltage levels. 5

Q.7. (a) Discuss the Fowler-Nordheim Tunneling and Hot Electron Injection in context with Flash Memory Programming. 5

(b) Draw symbols for PMOS and NMOS in both depletion mode and enhancement mode. What is the need of super buffers? Draw the circuit diagrams of different types of Super-Buffers. 5

Q.8. (a) What are the functions an IC package should perform? Differentiate between SMT and THT? 5

(b) Determine the input voltage in case of a CMOS inverter if $V_{DD} = 5V$, threshold voltage of PMOS is $-0.5V$, threshold voltage of NMOS is $0.7V$ and K (W/L) for PMOS is $70\mu A/V^2$ and for NMOS, it is $1mA/V^2$. 5

END SEMESTER EXAMINATION

July-2021

EP-4125: ROBOTICS ENGINEERING

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q1(a) Enlist the various components with brief description of microprocessor based robotic system and show by its diagram?
(b) Classify robot on the basis of Industrial application? What are the non-manufacturing areas of robotic applications?
- Q2 What is a control system? Describe the control loops of robotic system? Explain fuzzy controllers?
- Q3(a) What is the status of robots in the family of flexible automation technologies?
(b) Is robotics an automation? Distinguish between hard automation and flexible automation?
- Q4 What are the uses of sensor in robotics? What are the types of sensors used in robotics?
- Q5(a) Explain the different types of Robotics languages?
(b) Describe the MEMS working principle with suitable examples?
- Q6 Explain the Newton -Euler formulations by considering an example?
- Q7 How a robot vision is advantageous for online inspection work?
Describe a typical robot vision to inspect-
- (a) A machined mechanical metallic component
(b) A plastic component
- Q8 Write short note(Any Three)
- (a) Nano robots
(b) Robot Intelligence

- (c) Obstacle Avoidance
- (d) Sensing and Digitizing

Total No. of Pages: 1

EIGHTH SEMESTER
P]

END SEMESTER EXAMINATION

Roll No.

B.Tech. [E

(July 2021)

EP-4132 Space & Atmospheric Sciences

Time: 2:00 Hours

Max. Marks: 70

Note:

Answer any five questions
All questions carry equal marks
Assume suitable missing data, if any.

1. What is a black body? Deduce Plank's radiation law useful to explain the total black body radiation spectrum. Hence derive Wien's law and Rayleigh Jean's law from Plank's radiation law. (14 M)
2. Explain how atmosphere is divided into many different layers. Explain how temperature and pressure changes with height with proper reasons. (14 M)
3. Discuss the needs for upper air observations along with various techniques available to explore the structure of the upper air (14 M)
4. Explain the basic principles of radiosonde. What are the thermo dynamical parameters? Discuss their importance. (14 M)
5. What are trace gases? Explain various natural mechanisms and anthropogenic causes responsible for trace gases production. Explain the adverse effects of trace gases on human beings, animals and agriculture. (14 M)
6. Explain in detail the mechanism of production of tropospheric Ozone. Write its effect on various things in troposphere. Explain the role of Ozone in stratosphere. Explain depletion of Ozone in stratosphere and discuss its consequences. (14 M)

Pages = 2

OLD SCHEME

✓
B.Tech./M.Tech./MBA/Ph.D./B.Tech. (Eve.)

END SEMESTER EXAMINATION

July/Aug-2021

PAPER CODE **CE216** TITLE OF PAPER **STRUCTURAL ANALYSIS - I**

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1 Describe the characteristics and effects of a fixed support and a roller support in a beam. Draw neat sketches of both of them.
- Q.2 What do you understand by a determinate structure? Discuss how determinacy of a structure is checked by taking an example of a beam or a truss.
- Q.3 A simply supported beam AB has a span of 6 m. It is subjected to a concentrated downward force of 10 KN at the middle point of the beam. Draw shear force and bending moment diagrams for the beam.
- Q.4 Discuss how forces of differing magnitude and pointed to different directions are added to find resultant of them. Give a short example.
- Q.5 A cantilever beam is subjected to a concentrated downward load at the middle point of the span of the cantilever. Draw the deflected shape of the cantilever beam. Now as a second case, a roller support is added at the free point of the original cantilever beam, keeping all other things as same. Draw the deflected shape of this

propped cantilever if the same force is again applied at the same location.

- Q.6 A cantilever beam is having a span of 5m. It is subjected to a uniformly distributed load of intensity 5 KN/m over its entire span. Calculate reactions at the free support.
- Q.7 Discuss differences between a beam and a column in terms of their placement, types of forces applied on them and types of stresses which develop in them.
- Q.8 What is meant by a stable structure? Discuss how a structure can become unstable. Consider various types of failures which may occur in structures making them unstable.

6TH SEMESTER
END SEMESTER EXAMINATION

B.Tech./CIVIL

July/Aug-2021

PAPER CODE: CE 311 &

TITLE OF PAPER: Design of Steel Structure

Max. Marks : 70

Time: 3:00 Hours

Note : Answer any Five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1 Explain the different modes of failure of tension member?
- Q.2 Explain different steps involved in the design of gantry girder.
- Q.3 Design a simply supported plate girder of span 20 m carrying a factored udl of 60 kN/m, using only end stiffeners. Assume compression flanges is laterally supported.
- Q.4 Explain the following terms:
- Pitch of beams
 - Seated connection
 - Lacing and battening
- Q.5 Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 275 kN. The member is subjected to the possible reversal of stress due to the action of wind. The effective length if the member is 4 m. use 20 mm shop bolts of grade 4.6 for the connection.
- Q.6 Write neat sketches and explain different types of the following
- Splices.
 - Base Connection

Second SEMESTER(Old Scheme)
B.Tech.

END SEMESTER EXAMINATION

July-2021

PAPER CODE : CO116

TITLE OF PAPER : Programming Fundamentals

Time: 3:00 Hours

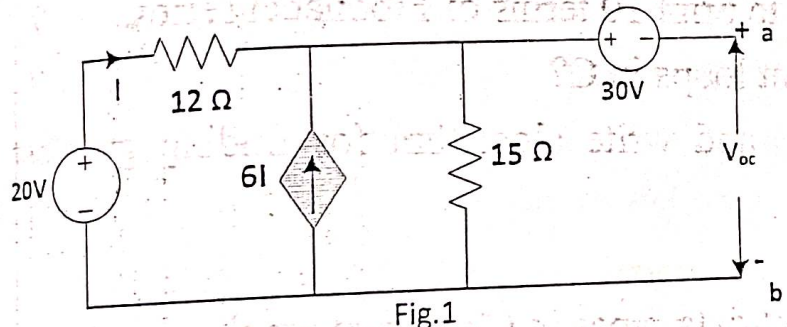
Max. Marks : 70

Note : Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

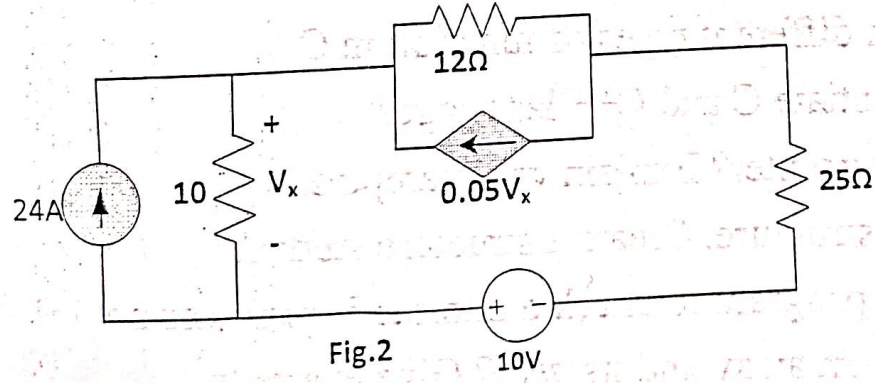
- Q.1 (a) Write a program to find the sum of n numbers. 7
(b) Explain keyword, variable. 7
- Q.2 (a) Write a program to print 10 terms of Fibonacci series. 7
(b) What are different loops in C? 7
- Q.3 (a) Draw flowchart, and write algorithm for finding greatest of three numbers 7
(b) What are different data types in C? give examples. 7
- Q.4 (a) Write a program to search a number in an array. 7
(b) Explain printf and scanf functions. 7
- Q.5 (a) Explain different types of function in C. 7
(b) Differentiate C and C++ languages. 7
- Q.6 (a) What is pointer? Explain with examples. 7
(b) Define structure. Create a structure student 7
- Q.7 (a) Write a program to check a number is prime or not 7
(b) What is an array and its uses? Give example. 7

Note: Attempt any FIVE. All questions carry equal marks. Assume suitable missing data, if any.

- (a) State and illustrate with the help of an example the Tellegen's Theorem.
(b) What do you understand by Independent & dependent Electrical Sources.
explain the classification of these sources.
- (a) Draw the power triangle. Define the Active, Reactive & Apparent Powers.
(b) Find the equivalent values of resistances for a delta connected load from a given star connected load.
- (a) Give the statement of Maximum Power Transfer Theorem. Prove it by taking suitable example.
(b) Draw the Thevenin's Model for the following circuit (fig.1)



- (a) Find the Voltage across 25Ω Resistance using Norton's Theorem (fig.2)



(b) Draw the phasor diagram for the following circuit diagram.(fig.3)

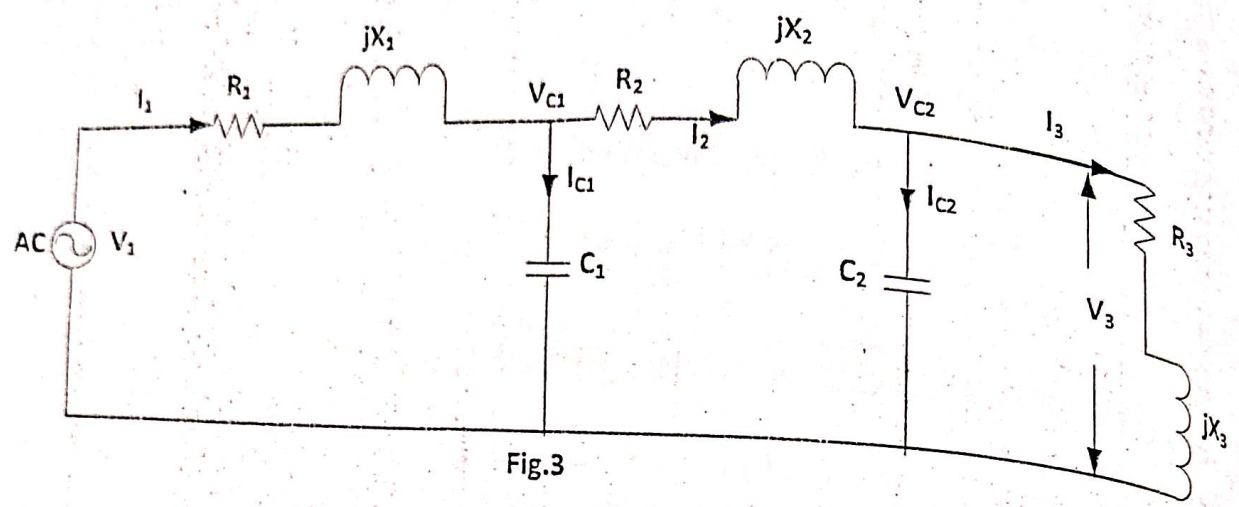


Fig.3

- 5. (a) Define bandwidth, quality factor, half power frequencies in a series RLC circuit. Also explain the relationship between these.
- (b). Explain the phenomenon of Series Resonance in an electrical circuits.
- 6. (a) Describe the Two-wattmeter method of power measurement for a three-phase star connected system with lagging power factor.
- (b) In a two wattmeter of power measurement, the total power consumed by a star-connected load is 25 kW. Find the readings of each wattmeter if the power factor of load is 0.8 lagging.
- 7. (a) Explain in detail the Core loss & copper loss in a transformer.
- (b) Draw the equivalent circuit diagram of transformer referred to Primary side.
- 8. Write short notes on any two of the following:-
 - (i) Single phase Auto-transformer, (ii) Moving coil instruments,
 - (iii) Analogies between Magnetic and Electrical circuits.
 - (iv) Digital voltmeter, (v) Moving iron instruments.

EC-313 CONTROL SYSTEM (OLD SCHEME)

Time: 3 Hours

Max. Marks: 70

Note: Answer Any five questions.
 All questions carry equal marks
 Assume suitable missing data, if any.

Q1. (a) The engine, body and tires of a racing vehicle affect the acceleration and speed attainable. The speed control of the car is represented by the model as shown in the Fig.1 shown below:

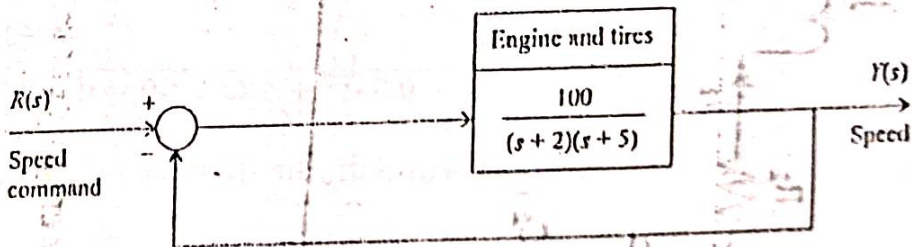


Fig.1

- (i) Calculate the steady state error of the car to a step command in speed.
 - (ii) Calculate the overshoot of the speed to a step command.
- (b) Consider the signal flow graph shown in Fig.2 :

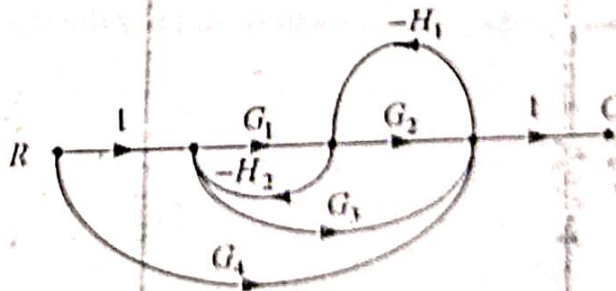


Fig.2

Find the transfer function $\frac{C}{R}$ of the signal flow graph shown above.

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$$G_p(s) = \frac{K}{(1+sT_1)(1+sT_2)}$$

For a unit impulse input, find the output response as a function of time. What is the value of peak overshoot (M_p) and when does it occur?

(b) Plot the root loci for a control system with

$$G(s) = \frac{K(s^2+6s+10)}{(s^2+2s+10)} \quad H(s) = 1$$

What is the shape of the loci traced?

Q3. (a) Find the range of K for which the system whose characteristic equation is given below is stable:

$$H(s) = s^3 + (K + 0.5)s^2 + 4Ks + 50 = 0$$

(b) Consider the open loop unstable system with the transfer function

$$G(s)H(s) = \frac{(s+2)}{(s-1)(s+1)}$$

Using Nyquist stability criterion, determine whether the system is stable when the feedback path is closed.

Q4. (a) Draw the complete Bode plot for system having the open loop transfer function

$$G(s) = \frac{1000(s+20)}{s^2+210s+2000}$$

(b) Consider a unity-feedback control system with the open-loop transfer function. Determine the value of the gain K such that the phase margin is 50°. What is the gain margin with this gain K?

$$G(s) = \frac{K}{s(s^2 + s + 4)}$$

Q5. (a) Obtain the state transition matrix of the following system:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

(b) A system is described by the state equations :

$$\dot{X} = \begin{bmatrix} 3 & 0 \\ -1 & 1 \end{bmatrix} X + \begin{bmatrix} -1 \\ 1 \end{bmatrix} U \quad \text{and } Y = [1 \quad 1]X$$

Determine whether the system is controllable and observable.

Q6. Write short notes on the following:

- (a) Lag and lead compensators
- (b) Minimum phase transfer function and non-minimum phase transfer functions
- (c) Properties of State transition matrix
- (d) Phase margin and gain margin

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END SEMESTER EXAMINATION
PAPER CODE EC-4122 TITLE OF PAPER-Microwave Integrated Circuits

July/Aug-2021

Time: 3:00 Hours

Max. Marks: 70

Note: Question No. 1 is compulsory and attempt five questions from the remaining. Assume suitable missing data, if any.

Q.1 The input to a three stage system is -12dBm. The power gain of the first stage is 40dB, for the second stage a loss of 35 dB, and for the third a gain of 25 dB. What is a output power in dBm and watts?

b. What are the advantages of the transistor oscillators as compare to diode oscillators?

c. What is the standing wave ratio in decibels for transmission line with a characteristics impedance of 50Ω if the load terminating resistance is 34Ω ?

d. Find the input impedance at a point in a transmission line 0.45λ away from the open for characteristics impedance of 75Ω .

e. What return loss does a VSWR of 4.5 represents?

(4x5=20)

Q.2 Distinguish between the characteristics impedance and input impedance. Under what conditions will they be the same? In a lossless line how can the input impedance be made purely inductive, capacitive, infinite and zero?

(10)

Q.3 A microwave transistor has the following S parameters measured with a 50Ω resistance at 10GHz.

$$s_{11} = 0.45(150^\circ), s_{12} = 0.01(-10^\circ), s_{21} = 2.05(10^\circ)$$

$$\text{and } s_{22} = 0.40(-150^\circ)$$

The source impedance is $Z_s=20\Omega$ and the load impedance is 30Ω . Compute power gain, the available gain, and the transducer power gain.

(10)

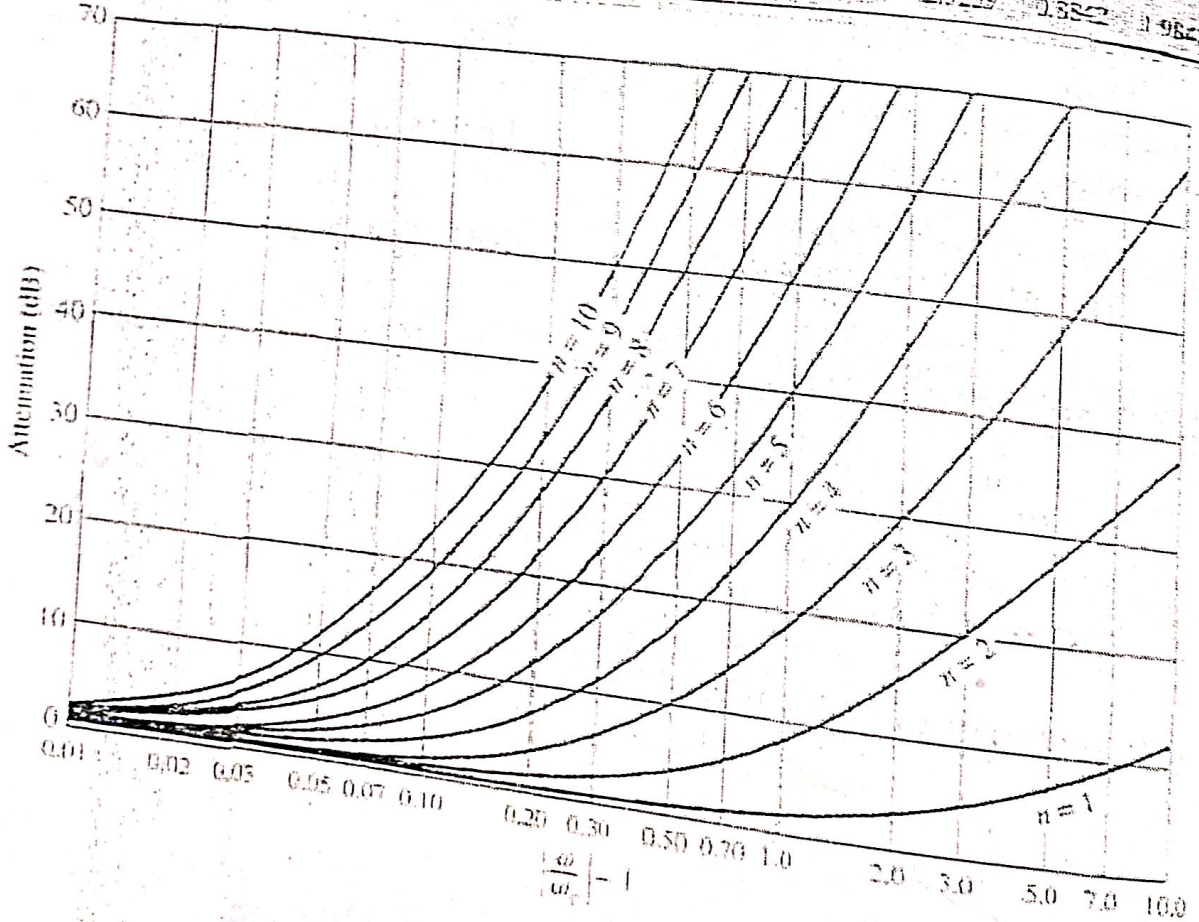
Q.4 A single pole, single throw switch use a PIN diode in a shunt configuration. The operating frequency is 4GHz; $Z_0=50\Omega$, and the diode parameters are $C_j=0.5\text{pF}$, $R_f=0.5\Omega$, $R_r=0.3\Omega$ and $L_j=0.3\text{nH}$. Find the electrical length of an open circuited shunt stub placed across the diode to minimize the insertion loss for the ON state of the switch. Calculate the resulting insertion losses for the ON and OFF state.

(10)

- Q.5 Explain the operation of an image rejection mixer using its equations. (10)
- Q.6 Determine the condition of oscillator and resonant frequency using BJT for Hartley oscillator using common emitter transistor. (10)
- Q.7 Design a five section high pass filter with a 3 dB equal-ripple response, a cutoff frequency of 1GHz, and an impedance of 50 Ω. What is the resulting attenuation at 06 GHz?

TABLE 8.4 Element Values for Equal-Ripple Low-Pass Filter Prototypes ($g_0 = 1, \omega_c = 1, N = 5$)

j	0.5 dB Ripple									
	g_j	b_j	c_j	d_j	e_j	f_j	g_j	h_j	i_j	k_j
1	0.8986	1.0710								
2	1.4029	1.4171	1.9841							
3	1.5565	1.0977	1.8954	1.0309						
4	1.0705	1.1526	2.3551	0.8279	1.5841					
5	1.7058	1.2230	1.7408	1.2295	1.7458	1.0309				
6	1.0224	1.2875	2.6974	1.5157	1.2758	0.8869	1.0321			
7	1.7572	1.2553	2.0351	1.3444	2.6381	1.2583	1.7372	1.0000		
8	1.7451	1.2649	2.6504	1.3590	2.0964	1.3389	2.5052	0.8795	1.5841	
9	1.5572	1.2649	2.6504	1.3573	2.7239	1.3673	2.6576	1.3699	1.7302	1.0309
10	1.4029	1.2721	2.6754	1.3725	2.7392	1.3805	2.7231	1.3485	2.5239	0.8842
										1.0309



Total No. of Pages : 02
VIII-SEMESTER

Roll no _____

B.Tech

July 2021

END SEMESTER EXAMINATION
EC- 4133 PATTERN RECOGNITION

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any SEVEN questions.
Assume suitable missing data, if any.

1. a) Consider the following dataset consist of five sentences. Using Naïve Bayes model identify which tag does the sentence A very close game belong to?

Text	Tag
"A great game"	Sports
"The election was over"	Not sports
"Very clean match"	Sports
"A clean but forgettable game"	Sports
"It was a close election"	Not sports

b) Find the SVD of given matrix A.

$$A = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{pmatrix} \quad (5+5=10)$$

2. a) Explain the design cycle of a pattern recognition system. (4+6=10)
- b) Explain the Perceptron algorithm.
3. a. What is the difference between parametric and non parametric pattern recognition methods?
- b. Write short notes on Maximum likelihood estimate. (5+5=10)
4. Explain Principal Component Analysis? Limitations of PCA? Also find PCA of the given data.

$$(x, y) = \{(2.5, 2.4), (0.5, 0.7), (2.2, 2.9), (1.9, 2.2), (3.1, 3.0), (2.3, 2.7), (2.1, 6), (1, 1.1), (1.5, 1.6), (1.1, 0.9)\} \quad (10)$$

5. a) Find a basis and rank for the row space of the given matrix A.
 $A = [3, 4, 0, 7; 1, -5, 2, -2; -1, 4, 0, 3; 1, -1, 2, 2]$

b) Write short notes on unbiased estimator. (5+5=10)

6. a) With suitable example describe the various methods used to measure the similarity between clusters.

b) Describe briefly about Gaussian Mixture model. (5+5=10)

7. Explain how support vector machine can be used to find optimal hyperplane to classify linear as well as nonlinearly separable data. Give suitable examples. (10)

8. Given two different classes, $w_1(5 \times 2)$ and $w_2(6 \times 2)$ have $(n_1=5)$ and $(n_2=6)$ samples respectively. Each sample in both classes is represented by two features as follows. Compute the linear discriminant projection of the two-dimensional data set.

$$w_1 = [(1, 2) (2, 3) (3, 3) (4, 5) (5, 5)].$$

$$w_2 = [(4, 2) (5, 0) (5, 2) (3, 2) (5, 3) (6, 3)]$$

(10)

9. What are the various methods to evaluate the classifier performance? To which category of clustering schemes does the k -means algorithm belong? What is its major advantage? Which are the factors that influence the computational duration of this algorithm? (10)

10. Explain Hidden Markov model and its role in the classifier design. (10)

Total No. of Pages : 2
Fourth Semester
[END SEMESTER EXAMINATION-JULY 2021]

Roll No.....
B: Tech. [Environment Engg.]

Paper code: ENE-214
Time: 3.00 Hours

Elements of Structural Analysis

Max. Marks: 70

Note:

Answer any three questions from section -A and any two questions from section - B.

Assume suitable missing data, if any.

BIS 456: BIS 800: Codes and steel table are permitted

SECTION -A

- 1 (a) What is meant by limit state? Enumerate the different types of limit states commonly used in limit states design. 4
- (b) Determine the limiting moment carrying capacity of a reinforced concrete rectangular section of size 200 x 550 mm deep (effective) reinforced on the tension side with four steel bars of 20 mm. The concrete is of grade M20 and reinforcing steel is mild steel of Fe250 grade. 10
- 2(a) Define the development length and its significance. Why is it necessary to provide vertical stirrups for the beam. 4
- (b) A reinforced concrete beam section of size 250 x 500 mm deep (effective) is subjected to a factored moment of 100 KNm and a factored shear force of 140 KN. The grade of concrete used is M20. Design the shear reinforcement using Fe500 grade steel bars. The effective cover to tension reinforcement is 50 mm. 10
- 3 (a) What is meant by slenderness ratio in compression members? Enumerate different criteria according to which columns are classified. 4
- (b) Design a reinforced concrete spiral column of 390 mm diameter subjected to an axial factored load of 1750 KN. The column is braced against sidesway and has unsupported length of 3.3 m. The concrete mix and steel to be used are M25 and Fe415. 10
- 4 (a) What is T and L beams? Describe the effective flange width and list the various factors that influence it and write down the expressions for the same. 4
- (b) Design a two way slab for a room 5.5 x 4.0 m clear in size if the superimposed load is 5 KN/m². Use M20 grade concrete and F415 steel. The edges are simply supported and corners held down. 10
- 5 Design a square spread footing to carry a column load of 1000 KN from a 40 cm square tied column containing 20 mm bars as the longitudinal steel. The bearing capacity of soil is 100

P.T.O

KN/m². Consider base of footing at 1 m below the ground level. The unit weight of earth is 20 KN/m³. Use M20 grade concrete and F415 steel.

SECTION-B

- 6(a) Explain the different modes of failure of riveted connections and list advantages of welded connections over the riveted connections.
- (b) A double cover butt joint is used to connect plates of 12 mm thick. Design the riveted joint and determine its efficiency. Take permissible stress as $f_t = 150$ MPa, $f_s = 100$ MPa and $f_c = 300$ MPa.
- 7 (a) What is net sectional area of a tension member? Discuss the procedure for calculating the net sectional area of different tension members.
- (b) An angle section ISA 50X30X6 mm is used as a tension member with its longer leg connected by 12 mm diameter rivets. Calculate its strength. Take permissible tensile stress as 150 MPa.
- 8 (a) What is the effective length of a compression member? Describe the effective length of compression member for different end conditions.
- (b) Design a single angle discontinuous compression member of steel roof truss to carry a load of 90 KN. The length of compression member between the centers of intersection is 2.5 m.

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Total No. of Pages 01
Eight Semester
End Term Examination
EN-411

Roll no
B.Tech. (Old Scheme)
July -2021

ENVIRONMENTAL IMPACT ASSESSMENT & AUDIT

Time: 3 hours

Max. Marks: 70

EN-411 Environmental Impact Assessment & Audit

Note: Attempt ANY FIVE questions
All the questions carry equal marks

- Q.1. (a) Discuss in detail the methodology of EIA.
(b) Discuss the process to establish environmental baseline in an EIA.
- Q.2. (a) What is impact identification? Discuss the significance of impact identification in EIA.
(b) Describe the various matrices used in impact identification.
- Q.3. (a) How is impact prediction done? Describe the limitations of prediction.
(b) Discuss avertive expenditure method for monetary valuation.
- Q.4. (a) What is impact evaluation? Briefly discuss the multi-criteria approach for evaluation.
(b) What do you mean by monetary valuation of impacts? What are its limitations? Explain.
- Q.5. Write short notes on
a) Environmental Evaluation System
b) Statistical model
- Q.6. (a) What do you understand by EMP? How is it designed? Explain.
(b) Discuss the advantages of public participation.
- Q.7. (a) What are the key features of an EIS? Explain.
(b) Discuss the Goals Achievement Matrix (GAM) in brief.

B. Tech. (Eighth Semester)

HU-413.1- Econometrics (University Elective)

Marks - 70 Marks
Time- 3.00 Hrs

Attempt any five questions.
Assume missing value, if any.

1. a	What do you mean by Econometrics? Discuss its relevance for engineers.	7																																	
1. b	<p>Ten industries of the State have been ranked according to profit earned in 2015-16 and the working capital for that year. Calculate the rank correlation coefficient.</p> <table border="1"> <thead> <tr> <th>Industry</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> <th>H</th> <th>I</th> <th>J</th> </tr> </thead> <tbody> <tr> <td>Rank (Profit)</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td>Rank (working Capital)</td> <td>10</td> <td>1</td> <td>6</td> <td>5</td> <td>8</td> <td>2</td> <td>4</td> <td>3</td> <td>7</td> <td>9</td> </tr> </tbody> </table>	Industry	A	B	C	D	E	F	G	H	I	J	Rank (Profit)	1	2	3	4	5	6	7	8	9	10	Rank (working Capital)	10	1	6	5	8	2	4	3	7	9	7
Industry	A	B	C	D	E	F	G	H	I	J																									
Rank (Profit)	1	2	3	4	5	6	7	8	9	10																									
Rank (working Capital)	10	1	6	5	8	2	4	3	7	9																									
2. a	Discuss significance of Assumptions of Multiple Linear Regression	7																																	
2. b	What do you mean by stochastic variable? Discuss significance of stochastic variable.	7																																	
3. a	<p>Suppose you collect data from a survey on wages, education, experience, and gender. In addition, you ask for information about cigarette smoking. The original question is: "On how many separate occasions last month did you smoke cigarettes?"</p> <p>Write an equation that would allow you to estimate the effects of cigarette smoking on wage, while controlling for other factors. You should be able to make statements such as, "Cigarette smoking five more times per month is estimated to change wage by x%".</p>	6																																	
3. b	Write a model that would allow you to test whether cigarette smoking has different effects on wages of man and women. How would you test that there are no differences in the effects of cigarettes smoking for men and women?	4																																	
3. c	Suppose you think it is better to measure cigarette smoking by putting people into one of four categories: non user, light user (1-3 cigarettes per day), moderate user (3-6 cigarettes per day), heavy smoker (more than 6 cigarettes	4																																	

The table below shows the average annual percentage rates of growth of employment, E and real GDP, g , for 25 OECD countries for the period 20XX-20YY. The regression output shows the result of regressing E on g . Provide an interpretation of the coefficients.

Average annual percentage rates of growth of employment and real GDP, 20XX-20YY:

Country	Employ.	GDP	Country	Employ.	GDP
Australia	1.68	3.04	Korea	2.57	7.73
Austria	0.65	2.55	Luxembourg	3.02	5.64
Belgium	6.34	2.16	Netherlands	1.88	2.86
Canada	1.17	2.03	New Zealand	0.91	2.01
Denmark	0.02	2.02	Norway	0.36	2.98
Finland	-1.06	1.78	Portugal	0.33	2.79
France	0.28	2.08	Spain	0.89	2.60
Germany	0.08	2.71	Sweden	-0.94	1.17
Greece	6.87	2.08	Switzerland	0.79	1.15
Iceland	-0.13	1.54	Turkey	2.02	4.18
Ireland	2.16	6.40	United Kingdom	0.66	1.97
Italy	-0.30	1.68	United States	1.53	2.46
Japan	1.06	2.81	-	-	-

4. How can we use the t test for determining the statistical significance of the slope of the regression line? 7
5. Explain the concept of multiple regressions and explain its importance in managerial decision making. 7
5. How White's test is an improvement over Goldfeld-Quandt test to discuss Heteroscedasticity? Discuss with suitable example. 7
6. Comment on the following statement: i
6. The management of M/s XYZ co. LTD stated in a special bulletin "..... The average salary paid to the workers in 2015 is nearly double that of 2005. So, our workers are enjoying a standard of living 100% higher in 2015 compared to 2005." 4
6. The average price of certain commodities in 2011 was Rs. 40 and the average

price of some commodities in 2012 was Rs. 80. Therefore, the increase in 2012 on the basis 2011 was 100%. So, the decrease should have been 100% in 2011, using 2012 as base.

6. From the following prices of different years, which year should be considered as reasonable base and why?

Year	2009	2010	2011	2012	2013	2014	2015
Prices	50	100	110	115	250	120	125

6. The government wants to increase the Dearness Allowance in the year 2017 to the employees for which a suggestion has been given that the year 1950 should be taken as base year for construction of Index Number. d
6. The Directorate of a company want to pay the Dearness Allowance in the year 2017 to their employees, whom they have already paid Dearness Allowance in 2014. For the construction of Index Number, which year should be taken as base year and why? e
- 6.f Will it be reasonable to include the prices of Television sets and Refrigerators in the construction of Cost of Living Index Number for workers? Give reasons in support of your answer. f
6. During a certain period, the cost of Living Index Number goes up from 110 and 200 and the salary of a worker is also raised from Rs. 3025 to 3500. Does the worker really gain, and if so, by how much in real terms? g
7. Show how measures of dispersion help in explaining that though frequency distributions may have the same values of their average, they may differ in their respective formation. In what respect are measures of dispersion of use in statistics? 6
7. 1. Discuss following 8
- i. where mode helps, median is useless
- ii. Where GM help, AM is useless
- iii. Can two Median value in a distribution.
- iv. Where weight should be given to the value?

IV SEMESTER Mechanical
END SEMESTER EXAMINATION

B.Tech (Even)

July/Aug-2021

ME 211 Thermal Engineering II

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) Draw and explain the PV diagram of a two stage reciprocating air compressor.
(b) Define the terms as applied to reciprocating compressor: Mechanical efficiency, isothermal efficiency, isentropic efficiency.

(7,7)

Q.2 (a) Define total to total, total to static, static to static and static to total efficiencies for centrifugal compressors
(b) Explain the phenomenon of stage pressure rise and surging in compressors.

(7,7)

Q.3 (a) With the help of PV & TS diagram compare efficiencies of Otto cycle, Diesel cycle and Dual cycle for the same compression ratio and heat rejection.

(14)

Q.4 (a) Sketch the schematic arrangement of open cycle gas turbine plant and name the components.
(b) Derive an expression for air standard efficiency of a Brayton cycle in terms of pressure ratio and compression ratio.

(7,7)

Q.5 (a) Compare the isentropic flow through nozzle and diffuser.
(b) How is the energy equation derived in the compressible flow? Explain

(7,7)

per day). Now, write a model that allows you to estimate the effects of cigarette smoking on wage.
The table below shows the average annual percentage rates of growth of employment, E and real GDP, G, for 25 OECD countries for the period 20XX-20YY. The regression output shows the result of regressing E on G. Provide an interpretation of the coefficients.
price of same commodities in 2012 was Rs. 80. Therefore, the increase in 2012 on the basis 2011 was 100%. So, the decrease should have been 100% in 2011, using 2012 as base.
From the following prices of different years, which year should be considered as reasonable base?

Q.6 Discuss any two of the following

- (i) Turbojet Engine
- (ii) Flow with Normal Shock waves
- (iii) Solid and liquid propellants
- (iv) Stagnation Properties

(7,7)

Note : Answer any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 [a] With the help of neat sketch, describe the inversions of single slider crank chain.

[b] State and prove the law of gearing and velocity of sliding.

$7 \times 2 = 14$

Q.2 The crank rotates at the particular instant with angular velocity of 600 rpm and angular acceleration of 1.5 radian/second. The instant sketch is shown in Fig. 1 below. All the dimensions are in meter. Draw velocity and acceleration diagram and determine the velocity of N with respect to C. The crank is 2.5 m at angle 45° , main connecting rod 15 m hinged at 6 m from crank pin. 14

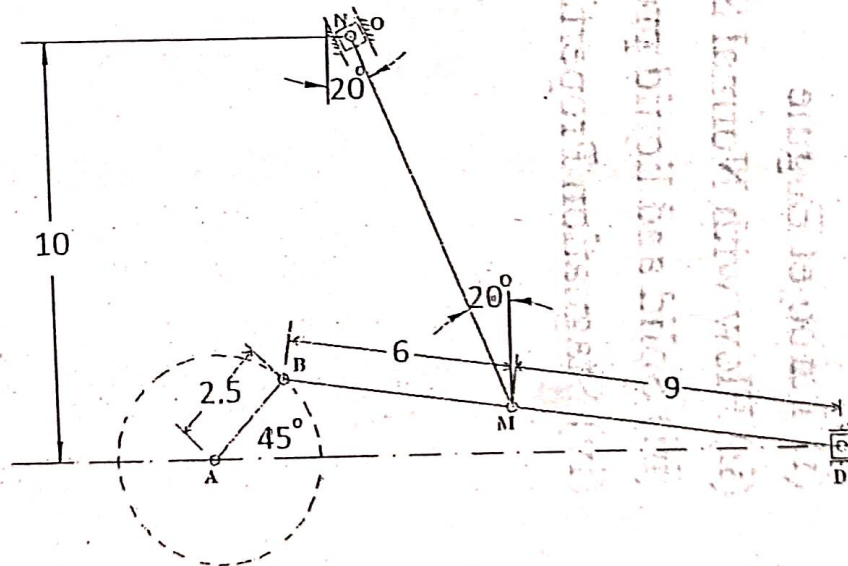


Fig.1

— 18 —

Q.3 Attempt any two of the following: $7 \times 2 = 14$

[a] Describe the compound and reverted gear trains with the help of neat sketch.

[b] State and describe the law of belting.

[c] Differentiate between Davis and Ackerman steering gears.

Q.4 An epicyclic gear train as shown in Fig.2 has three gears A, B, and C. Gear wheel A has 144 internal teeth and fixed to the frame so stationary. Gear C has 60 external teeth. The gear B meshes with A and C. Gear B is carried on an arm which rotates about the centre A at 60 rpm. Determine the speed of wheel B and C. 14

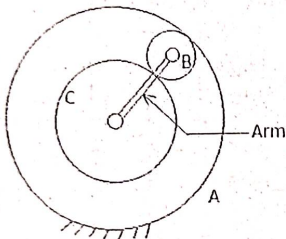


Fig.2

Q.5 Discuss the power loss during constant pressure and uniform rate of wear theory. Draw the displacement curve and cam profile for the roller follower having radius 8mm to attain the following specification of cam-follower mechanism.

The base circle of cam has radius 15 mm and lift of follower is 20 mm.

The upward motion of follower is with uniform velocity to 90° .

The dwell period at the top most position is 60° .

The return motion of follower is with simple harmonic motion to 90° .

The rest is dwell period. 14

Q.6 Determine the maximum power transmitted by an open belt drive having width 10 mm, thickness 5 mm, density 0.98 gram/cm^3 . The coefficient of friction between belt and pulley is 0.35. The belt and pulley have contact by 120° . If the maximum stress in the belt is not to exceed 150 N/cm^2 . Also calculate the corresponding linear speed of the belt. 14

Q.7 Attempt any two of the following:

[a] Discuss the steps in Klein's construction and its applications.

[b] Compare the knife edge, roller follower and flat face followers in cam-follower mechanisms.

[c] Write short note on film lubrication in rotating shaft. $7 \times 2 = 14$

Q.8 Describe any two of the following:

[a] Law of steering with the help of an example

[b] Torque loss through uniform pressure and uniform rate of wear theory and its applications.

[c] Location of instantaneous centres in single slider crank chain and four bar chain mechanisms $7 \times 2 = 14$

END

Total no. of Pages 01
VI SEM

MECHANICAL ENGINEERING

ME-311:

Heat and Mass Transfer

(July-2021)

Roll no....
(B.Tech.)

TIME: 3 hrs.

Max. Marks: 70

Attempt any five Questions

Q1 Derive the expression of rate of heat transfer and temperature distribution in (i) Hollow Cylinder (ii) sphere with constant heat generation (14)

Q-2 Explain the reasons that overall heat transfer coefficient is different in composite cylinder and composite sphere. Also Derive the expression for overall heat transfer coefficient in three layered (i) composite hollow cylinder and (ii) three layered composite sphere (1+6+7)

Q-3 Define critical thickness of insulation. Explain the utility. Derive the expression for critical thickness of Insulation for (i) Sphere (ii) cylinder (2+12)

Q4(a) Derive the expression for energy stored, Rate of heat transfer and temperature distribution using Lumped capacity method (6)

(b) Define intensity of radiation and also derive the expression for radiation exchange between two surfaces and prove the reciprocal theorem (8)

Q-5 Define the terms with physical significance of fin efficiency and fin effectiveness. also Derive the expression for temperature distribution and rate of heat transfer for fin when (i) fin is too long (ii) fin is well insulated (ii) fin is open to surroundings. (2+12)

Q6 (a) Define the terms with physical significance:

- (i) Sherwood number, (ii) Schmidt Number, (iii) Mass Stanton Number
- (iv) Nusselt Number (v) Biot Number (vi) Fourier Number
- (vii) Geometric Number (viii) Prandtl Number (ix) Stanton Number
- (x) Thermal diffusivity (10)

(b) What are the methods for finding convective heat transfer coefficient. Using dimensional analysis, prove that Nusselt number is a function of Reynold number and Prandtl number in forced convection mode or Nusselt number is a function of Groshief number and Prandtl number in natural convection mode (4)

Q-7(a) Define heat exchangers. How can you classified. How you can compute overall heat transfer coefficient (2)

(b) Derive the expression for LMTD and effectiveness of heat exchanger in parallel flow or counter flow arrangement (4+8)

Total No. of Pages: 02

B. Tech. (ME)

End Semester Examination (Old Scheme)

ME-313 MACHINE DESIGN - I

Roll No.

Sixth Semester

(July -2021)

Time: 3 hrs

Max. Marks: 70

Note: Attempt any FIVE questions. Assume suitable missing data, if any. Use of design data handbook is permitted.

- 1) (a) Draw Goodman diagram, Soderberg line, and Gerber parabola. Explain it briefly. [5]
- (b) Define the term 'stress concentration factor,' notch sensitivity, and fatigue. [5]
- (c) Explain the bending failure of the cotter. [4]
- 2) Design a spigot-socket cotter joint for an axial load of 90kN in tension and compression. It is assumed that all parts are made of the same material with the permissible stress of 70MPa, 40MPa, and 100Mpa in tension, shear and compression, respectively. Also, sketch the joints. [14]
- 3) Design a triple-riveted double strap butt joint with unequal covers for, longitudinal joint, a boiler shell having a 1.5m internal diameter to withstand maximum pressure 2.4N/mm². Assume that shell plate and rivets are made of C-20 steel having the following allowable stresses, $\sigma_t=80\text{N/mm}^2$, $\tau=50\text{N/mm}^2$, and $\sigma_c=120\text{N/mm}^2$. [14]
- 4) A solid shaft is subjected to a twisting moment of 600N-m, a bending moment of 300N-m. If the maximum allowable values of normal and shear stresses are 140N/mm² and 80N/mm², respectively, determine the diameter of the shaft. [14]
- 5) Design a helical spring used in an engine for the given data.
- Length of spring when the valve is open=40mm
Length of spring when the valve is closed=50mm
Spring load when the valve is open=400N
Spring load when the valve is closed=200N
Maximum inside dia of spring=28mm
Maximum permissible shearing stress=400Mpa
Modulus of rigidity=80GPa [14]

- (6) It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear is made of plain carbon steel 40C8 ($S_{ut}=600\text{N/mm}^2$). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions and suggests suitable surface hardness for the gears. [14]
- (7) Design and draw a cast iron protected type flange coupling to connect two shafts of 36mm diameter transmitting 15kW at 720rpm. The overload capacity is 1.25 times the average torque. The bolts and keys are made of C20 steel, and the flange is made of FG200. [14]

-END-

Total No. of pages 02

ROLL NUMBER.....

B.Tech (MECHANICAL ENGG.)-VI SEMESTER

PRODUCTION & OPERATIONS MANAGEMENT-II (ME-315)

End Term Examination

MAX. MARKS: 70

MONTH & YEAR: JULY, 2021

Time : 3:00 hr

NOTE:

1. Answer any five questions. All questions carry equal marks.
2. SQC charts/tables are allowed.
3. Assume suitable missing data if any.

Q1. (a) Discuss loading, sequencing, routing with the help of suitable industry example. Why they are important for the operational performance at shop floor. [7]

(b) Discuss the advantages and disadvantages of using SPT, LPT, EDD, TSPT, TLPT rule of sequencing jobs on a machine. Also, discuss the most suitable scenario for each of rule. [7]

Q2. (a) Differentiate between MRP-I and MRP-II. [6]
 (b) Each unit of A is composed of one unit of B, two units of C, and one unit of D. C is composed of two units of D and three units of E. Items A, C, D, and E have on-hand inventories of 20, 10, 20, and 10 units, respectively. Prepare the bill of materials and calculate the net requirement of each B, C, D, and E for 100 units of A. Write all your assumptions clearly. [8]

Q3. (a) What do you understand by quality control and quality assurance? Discuss the various quality control tools. [7]
 (b) Explain the method of estimating standard time using work sampling. Why Standard times are set up for jobs in a company? [7]

Q4. A high-voltage power supply should have a nominal output voltage of 350 V. A sample of four units is selected each day and tested for process-control purposes. The data shown in table give the difference between the observed reading on each unit and the nominal voltage times ten; that is

$$x_i = (\text{observed voltage on unit } i - 350) \times 10$$

- (a) Set up \bar{x} and R charts on this process. Is the process in statistical control?
- (b) If specifications are at $350 \text{ V} \pm 5 \text{ V}$, what can you say about process capability? [14]

Sample Number	x1	X2	X3	X4	Sample Number	x1	X2	X3	X4
1	6	9	10	15	11	8	12	14	15
2	10	4	6	11	12	6	13	9	11
3	7	8	10	5	13	16	9	13	5
4	8	9	6	13	14	10	13	10	13
5	9	10	7	13	15	11	7	10	13

6	12	11	10	10	16	15	10	11	10
7	16	10	8	9	17	9	8	12	9
8	7	5	10	4	18	15	7	10	4
9	9	7	8	12	19	8	6	9	4
10	15	16	10	13	20	13	14	11	12
									13

Q5. (a) What do you understand by reliability? How can the reliability of equipment be improved? [7]

(b) Write the 18 Therblig used in motion study along with their symbols and colour coding. [7]

Q6. (a) What is the difference between motion study and method study? What are the main objectives of performing the work measurement, method study, and motion study? [7]

(b) What is the relationship between work study and productivity? Discuss. [7]

Q7. Write the short notes on any four of the following. [3.5*4 = 14]

- (i) Flow diagram Vs. String diagram
- (ii) Productivity
- (iii) Cycle graph Vs. Crono-Cycle graph
- (iv) Operation process chart Vs. Flow process chart
- (v) Bath Tub Curve
- (vi) MRP-I Vs. MRP-II

Total no. of pages: 02	Roll No. _____
B.Tech (Mechanical Engineering)	
SUPPLEMENTARY EXAMINATION	
July-2021	

Time: 3 Hours Max. Marks: 70

Note: Attempt any five questions.
All questions carry equal marks.
Assume missing data, if any.

- 1 (a) Briefly discuss about coated tools. Describe the methods of coating the cutting tools.
(b) Show with the help of different views the general shape of a single point cutting tool.

Also discuss the significance of different elements of geometry of a single point cutting tool.

- 2 (a) Define machining. Briefly discuss about orthogonal and oblique cutting. Describe various types of chips formed in metal cutting along with their favourable conditions.

(b) In an orthogonal cutting operation on a material with shear yield strength of 250 N/mm² the following data is observed.

- Rake angle of tool = 15 degree
- Uncut chip thickness = 0.25 mm
- Width of chip = 2 mm
- Chip thickness ratio = 0.46
- Friction angle = 40 degree

Determine the shear plane angle, the cutting force component, shear force and resultant force on the tool.

- 3 (a) What do you understand by the term tool life? Enumerate the factors affecting tool life. Also discuss the importance of life testing of cutting tools.

(b) Mild steel bars of 50 mm diameter are to be turned over a length of 160 mm with a depth

of cut of 1.5 mm feed of 0.2 mm/rev. at 650 rpm by carbide tools. If the tool life equation

is

$$V T^{0.36} f^{0.31} d^{0.13} = 310$$

Determine how many components may be turned before regrinding the tool.

- 4 (a) Define the term fit in metrology? Describe different types of fits with neat sketches.

(b) Determine the tolerances on the hole and shaft for a precision running fit designated by

50H7g6. You may assume 50 mm lies between the range 30-50 mm.

Fundamental deviation of g shaft = $-2.5 D^{0.34}$. State actual maximum and minimum sizes of both hole and shaft and maximum and minimum clearances.

5 (a) What is Sine bar? Sine bar is generally not used for measurement of angle more than 45° . Justify it with proper reasoning.

(b) A 100 mm Sine bar has to be set up at an angle 40° . Determine

(i) Slip gauges needed to measure the above angle.

(ii) In setting the Sine bar to above angle, what error be introduced

(iii) If assume 100 mm separation is actually 100.005 mm.

(iv) Upper cylinder of Sine bar is bigger than actual size by 0.002 mm.

(v) Slip gauges used have an unexpected error of 0.005 mm.

6 Write short notes on any four of the following-

(a) Milling and Grinding process

(b) Screw threads

(c) Alignment test of machine tools

(d) Jigs and Fixtures

(e) Line and end standard

Total No. of Pages -2 Roll No. 2101

VIII SEMESTER (Mechanical)

B.Tech.

END SEMESTER EXAMINATION Jul-2021

ME-41217 Computational Fluid Dynamics

Time: 3 Hours

Max. Marks: 70

Note: Attempt any Five questions. Assume suitable missing data, if any.

- 1 (a) Explain how CFD plays an important role in various engineering sciences. 7
- (b) Compare conservative and non-conservative form of governing equations and their impact on CFD. 7
- 2 (a) Write down the most generic form of a partial differential equation used in CFD and explain the significance of each term. 7
- (b) Identify the nature of the following systems of partial differential equations:
and where u and v are the two dependent variables. 7
- 3 Explain the importance of various forms of fluid models with neat sketches and explain 14
- (i) How do we use respective models to derive governing equations of fluid flow.
- (ii) How do these models effect CFD methodology.
- 4 (a) Discuss the mathematical and physical behavior of flows governed by parabolic equations with an example of boundary layer flows. 7
- (b) Explain the CFD Technique to solve the conservation form of viscous flow governing equations for unsteady problem. 7
- 5 (a) Describe suitable grid method for moving body problems specifying grid quality parameters with neat sketches. 7
- (b) Discuss briefly about multi block and non conformal 7

grids with neat sketches with applications.

- 6 (a) What is meant by finite volume discretization? Explain the features which distinguish the interpretation of finite volume methods from the finite difference approach. 7
- (b) List the various types of errors and how these effect the stability of solution? Explain 7
- 7 (a) Explain PISO algorithm for solving incompressible viscous flow problems. 7
- (b) Give advantages and its disadvantages of PISO over SIMPLE and SIMPLEC algorithms. 7
- 8 Write short notes on any two of the following 14
- i Computational Time and accuracy
 - ii Commercial codes
 - iii Adaptive grids and unstructured meshes
 - iv Grid generation, techniques and application.

B.Tech (MECHANICAL ENGG.)-VIII SEMESTER
SUPPLY CHAIN MANAGEMENT (ME-4133)
END TERM EXAMINATION

MAX. MARKS: 70

MONTH & YEAR: JULY, 2021

Time : 3:00 hr

NOTE:

1. Answer ANY FIVE questions. All questions carry equal marks.
2. Assume suitable missing data if any.

Q1. Discuss the various uncertainties involved in the supply chain of a FMCG company. How you will manage these uncertainties particularly in a COVID-19 type situation?

Q2. Describe the cycle and push/pull views of a supply chain. Consider the purchase of a mobile phone at the retailer shop. Describe the various stages in the supply chain and the different flows involved.

Q2. What are reasons of "bullwhip effect" in a supply chain? How it impacts the performance of supply chain? Discuss the remedies to mitigate its effect.

Q3. What do you understand by responsiveness in supply chain management? Compare it with the cost minimization in supply chain. Can we achieve both together? Explain. What is more important in a pandemic like situation?

Q4. What do you understand by aggregate planning? Describe the information needed to provide an aggregate plan. Explain various strategies associated with aggregate planning with the help of steel sector business example.

Q5. Discuss the term "Risk Pooling". Do you expect aggregation of inventory at one location to be more effective when a company such as Dell sells computers or when a company such as Amazon sells products? Explain by considering transportation and inventory costs.

Q6. Discuss the role of sourcing in a supply chain. How 3PL is useful in achieving supply chain objectives of an e-commerce company. What are the risks of using a third party?

Q7. End item P is composed of three subassemblies: K, L, and W. K is assembled using 3 G's and 4 H's. L is made of 2 M's and 2 N's. W is made of 3 Z's. On hand inventories are 20 L's, 40 G's, and 200 H's.

- (i) Prepare Bill of Materials for item P.
- (ii) Determine the net requirement of each subassembly and parts for producing 100 units of P.

Total no. Of pages : 2

Roll No.

Fourth Semester B.Tech. (Branch -Production-)

END SEMESTER EXAMINATION JULY 2021

(Old Scheme)

PE 215 THERMAL SYSTEMS - II

Time : 3 hr

Max Marks: 70

Answer any FIVE questions. Assume missing data suitably if any.

1 (a) Derive the expression for air standard cycle efficiency and mean effective pressure of diesel cycle.

(b) Explain the working principle of reheat gas turbine cycle with a neat sketch. (9,5)

2 (a) An engine working on Otto cycle has a pressure and temperature of 1 bar and 300 K at the beginning of compression stroke. Compression ratio is 8 and 1900 kJ/kg of heat is added at constant volume. Determine pressure and temperature of all salient points in the cycle, air standard cycle efficiency and mean effective pressure of the cycle.

(b) Discuss the effect of pressure ratio on work output of gas turbine cycle. (9,5)

3(a) State merits and demerits of gas turbine plant.

(b) The following data refers of a GT set:
Inlet temperature of air = 300 K , Maximum temperature after combustion = 1040 K, Pressure ratio = 4, $\eta_c = 86\%$, $\eta_t = 92\%$.
Determine overall thermal efficiency of the plant (i) without heat exchanger (ii) with heat exchanger of effectiveness of 0.7 (5,9)

4(a) Derive the expression for workdone on centrifugal compressor with a neat sketch. Draw and explain the velocity triangles of centrifugal compressor

(b) Explain the surging and choking of compressor (8,6)

5(a) Derive the expression for workdone on multi stage reciprocating compressor. State assumptions made.

(b) A three stage compressor is used to compress air from 1 bar to 36 bar. The temperature of at inlet to the compressor is 300 K. Neglecting the clearance and assuming perfect intercooling, determine the indicated power required to deliver 15 m³ of air / min . Take index of compression as 1.25 and also determine the intermediate pressures. (7,7)

6(a) Derive the temperature distribution and rate of heat transfer through a heat conduction in a three layered composite cylinder

(b) Explain the laws of Radiation heat transfer. (8,6)

7(a) A furnace wall comprises of two layers of fire clay 80mm thick ($k=1.2$ W/m/K) and mild steel of 6 mm thick ($k=40$ W/m/K). The inside surface of brick is at 900 K and the steel is surrounded by air at 300 K with heat transfer coefficient of 6 W/m²/K. Determine the heat flux through the wall and inside and outside surface temperature of steel.

(b) Explain briefly the principle of convection mode heat transfer. (9,5)

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- 14

SIXTH SEMESTER

B.Tech. [PE]

END SEMESTER EXAMINATION

July/Aug-2021

PE-311

METAL CUTTING & TOOL DESIGN

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any **FIVE** questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- 1 (a) Draw merchant's circle diagram, explain all the notations used. State the assumptions made in the development of the diagram.
(b) What is the difference between Orthogonal cutting and Oblique cutting?
- 2 (a) What are the sources of heat in metal cutting?
(b) Discuss the different types of tool wear mechanisms.
- 3 (a) What is machinability? How machinability is evaluated?
(b) What is tool life? Explain various factors by which tool life affected.
- 4 (a) Considering the design of a broach discuss the following:
 - (i) Constant load per tooth
 - (ii) Total length of Broach
(b) What is the purpose of chip breaking while machining? Discuss the different types of chip breakers.
- 5 (a) Sketch a three-view diagram of HSS tool and show various angle on it.
(b) Explain different types of oil-based cutting fluid.
- 6 Write short notes on any **FOUR** of the following:
 - (a) Effect of back rake angle on cutting
 - (b) Ceramics tool
 - (c) Multi-point cutting tool
 - (d) Chip removal and chip-less processes
 - (e) Grinding operation

Total No of Pages...2.....

SIXTH SEMESTER

END SEMESTER EXAMINATION

PE-315

Roll No.....
B Tech (Production Engineering)

(July-2021)

MECHATRONICS

Paper Code

Time: 03 Hrs.

Title of the Subject

Max Marks. 70

Note : Question No. 1 is compulsory.
Out of the rest attempt any four questions.
In total attempt not more than Five questions.
Assume missing data, if any.

Q No 1

Differentiate between.

(7x2=14)

- (a) – Systematic and Random errors.
- (b) – Accuracy and Precision.
- (c) – Dead End and Backlash.
- (d) – Transient response and Steady state response.
- (e) – Analog and Digital signal
- (f) – Amplification and Filtration.
- (g) – Proximity Sensors and Proximity Switches.

Q No 2(a) Giving example of a Mechatronic system, explain its working, showing various components of it. (7)

Q No 2(b) Discuss various types of Transducers used for Pressure measurement covering all ranges, in brief? (7)

Q No 3(a) Discuss the types of Operational Amplifiers used in Signal Conditioning, in brief? (7)

Q No 3(b) Discuss various functions under Signal Conditioning, which are used in a Mechatronic systems. (7)

Q No 4(a) How basic system models help in designing a Mechatronic system? Explain taking example of some basic building block, showing some engineering application. (7)

Q No 4(b)---What are the dynamic characteristics of Sensors? Also discuss the considerations made, while selecting a Sensor? (7)

- Q No 5(a) What is the purpose of Analog to Digital conversion and Digital to Analog conversion. Also explain, how it is done? (7)
- Q No 5(b) What is Logic gate? Discuss various types of basic Logic gates used in Mechatronics. (7)
- Q No 6(a) What is the importance of applying system transfer function for studying behavior of a mechatronic system? How does Laplace transformation help in it. Explain in brief. (7)
- Q No 6(b) What is role of Phasor and Phasor equation in studying Frequency response of a system? (7)
- Q No 7(a) What is the difference between dynamic behavior of the First order and second order systems? Find out the expressions for First order systems under conditions of (i) - Natural response (ii) - External Force. (7)
- Q No 7(b) Showing the arrangement of the various components of a Programming Logic Controller, explain how PLC can be compared with a Computer? (7)
- Q No 8 Write Short Notes on any four of the following.
- (a) - Measurement Errors
 - (b) - LVDT.
 - (c) - Digital Signal Processing.
 - (d) - Multiplexers
 - (e) - Bode Plot
 - (f) - Ladder Programming
 - (g) - Servomotors