QUESTION PAPERS FOR SUPPLEMENTARY EXAMINATION FEBRUARY-2020

M.TECH (FT/PT)

1st, 3rd & 5th SEMESTER

Issued
13/09/21

QUESTION PAPERS FOR M.TECH. I SEMESTER (FT&PT) & III SEMESTER (PT) SUPPLEMENTARY EXAMINATION, FEBRUARY-2020

I N D E X

Total No. of pages 02
Lst SEMESTER

Roll No._____
M.Tech.[Civil Engg.(STR. ENGG.]
Branch/ Group code

END SEMESTER EXAMINATION FEB. 2020(Old Course)

CE503 FINITE ELEMENT METHOD OF STRUCTURAL ANALYSIS
Paper Code Title of the Subject

Time: 03 Hours Max. Marks: 100

Note: Attempt all questions. Assume suitable missing data if any.

Q.1 Answer any five parts of the following: [5 x 08 = 40]

a) Develop the shape functions of node 1 and 5 of a cubic triangular element of Lagrangian family as shown in figure 1 below.

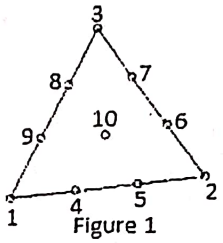


Figure 1

b) Explain discretization errors.

c) Explain truss problem definition based on state variable, strain displacement relationship, constitutive relationship.

d) Develop the shape function of all the nodes of a linear rectangular element of Lagrangian family.

e) Derive strain displacement relationship, state variable and nodal displacement relationship and A matrix for a plane strain problem using linear triangular element using generalized coordinate approach.

f) Explain Mesh refinement procedures.

g) Explain shear locking behavior.

Q.2 Answer any four parts of the following: [4 x 10 = 40]

a) Derive the Action Displacement relationship using Galerkin's method of weighted residual to solve governing differential equation for beam problem based on EBBM.

b) Define state variable for a thin plate bending problem based on Kirchoff's theory, and derive A matrix for a 4 noded rectangular element of size 'a x b' having 3 dofs $w_i, \theta_{x_i}, \theta_{y_i}$ at each node using generalized coordinate approach.

c) Give reasons to explain the non-conformity of displacement model for the problem in Q.2(b) even if it satisfies the compatibility and completeness requirements and prove that it leads to slope discontinuity.

d) Explain the Gauss Quadrature method, implemented using Lagrangian interpolation polynomial.

e) Explain the Cartesian mapping for triangular elements from natural coordinates.

f) Obtain the governing differential equations and natural boundary conditions using variational formulation for a beam problem based on Euler Bernoulli beam model, subjected to suitable loading as shown in figure 2.

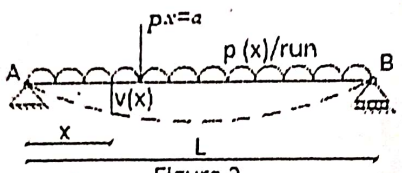


Figure 2

Q.3 Answer any two parts of the following: [2 x 10 = 20]

a) Explain and derive the shape functions for beam problem using Hermitian polynomials approach.

b) Evaluate integral $\int_{A^e}(4L_1 - 1)^2 dA$ using direct integration, using integration formula and using numerical integration method for a quadratic triangular element with straight boundaries using 3 point GQR.

c) Evaluate the load vector for the triangular element having thickness t shown in figure 3 below subjected to linearly varying loads as shown.

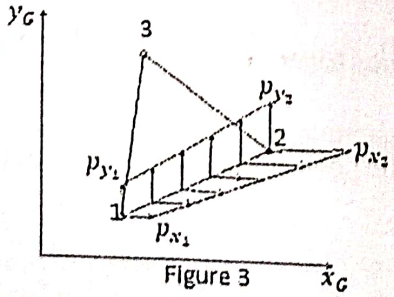


Figure 3

Total no. of Pages 01 — 03 — Roll No._____

THIRD SEMSTER M. Tech (Geotechnical/Structural Engineering)

Soil Structure Interaction (CE 7013 + CE 7213)

SUPPLEMENTARY EXAMINATION February-2020

Time: 3 Hrs. Maximum Marks: 100

Note:	Answer any **Five** questions Assume suitable missing data, if any

1. a) What is Winkler's model? How is this model used for elastic foundation? Write the limitations of this model. 10

   b) Derive equation for infinite beam with concentrated load using suitable boundary conditions. 10

2. a) Classify finite beams on the basis of stiffness. Explain method of superposition for analysis of finite beams. 10

   b) A 10m long finite beam rested in elastic foundation of size 0.5m x 1.1m, carries a load of 250 KN, moment 100 kN-m and u.d.l. of 200 kN/m for a span of 5m at a distance of 1m, 4m and 5m from its left end, respectively. Find vertical deflection, slope of deflected line and draw SFD and BMD. 10

3. a) What do you mean by infinite plate? List the type of plates? Also write the assumptions made in bending of plate. 10

   b) Find the maximum bending moment and maximum deflection of a rectangular thin plate acting with sinusoidal loading? 10

4. a) What is efficiency of a pile group? Discuss the behaviour of settlement of a pile group in clay and sand. 10

   b) How rigid cap differs from flexible cap during load distribution in a pile group? With a neat diagram, explain the various forces that come into effect during design of pile cap. 10

5. a) What is Hrennikof's analysis of pile group? List the assumptions made by Hrennikof's for the analyse of pile group? 10

   b) A concrete pile, 30 cm square and 5 m long, is subjected to a horizontal load of 5 kN and a moment of 4 kN-m at the ground level. Taking η_h= 20 N/cm^3, find maximum bending moment and deflection if (i) the head of the pile is considered to be free (ii) the head is considered fixed with no external moment. Assume maximum bending moment occur at $\frac{1}{4}$ m depth.
   Take at Z = 0, A_y= 2.435, B_y= 1.635, $A_s = -1.623$ and $B_s = -1.75$
   at Z = 1, $A_m = 0.727$ and $B_m = 0.852$. 10

6. Write short notes on (any four) 5x4=20

   a) Elasto-Plastic soil model
   b) Time dependent behavior of elastic model
   c) Causes and effects of negative skin friction
   d) Influence Chart
   e) Factors affecting modulus of subgrade reaction

— 04 —

Roll No.....

Total No. of Pages 01

M.Tech.

5th SEMESTER

SUPPLYMENTRY EXAMINATION feb-2019

PAPER CODE: CO-7013 Natural Language Processing

Time: 3:00 Hours

Max. Marks : 100

Note: Answer five questions. Question No. 1 is compulsory. Assume suitable missing data, if any.

Q.1 Answer all the following questions: [20]

[a] Explain Part of speech tagging..

[b] Discuss Name Entity Recognition (NER).

[c] What are NLU and NLG.

[d] Explain the three ways of word formation with example.

[e] What is cosine similarity?

Q.2[a] Differentiate between stemming and lemmatization. [10]

[b] Explain betweenness and closeness centrality measures. [10]

Q.3[a] Discuss any one method for machine translation. [10]

[b] Explain Viterbi algorithm. How Viterbi algorithm can be used to handle the spelling error detection and correction problem. [10]

Q.4[a] What is Sentiment analysis. Discuss a method to handle negation in sentiment analysis. [10]

[b] Describe the ambiguities at the all level of language understanding in natural language processing. [10]

Q.5[a] Analyze the significance of Word Sense Disambiguation in NLP. Explain any one WSD method [20]

Q.6[a] What are top-down and bottom-up parsers ? [10]

[b] What is the difference between semantic relatedness and semantic similarity. [10]

—05—

Total No. of Pages 1 *Roll No. .....*

M.Tech (C&I) *FIRST SEMESTER*

SUPPLEMENTARY EXAMINATION *(Feb–2020)*

C&I 5303 NONLINEAR CONTROL THEORY

Time: 3 Hours *Maximum Marks : 50*

Note : Answer **ANY FIVE** questions.
Assume suitable missing data, if any.

1[a] Describe with help of examples finite scape time, limit cycle and chaos behavior of Non-linear system.

[b] Derive the Describing function for the ON-OFF relay characteristic shown in Fig.1.

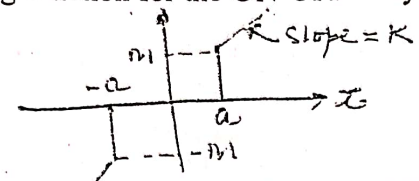
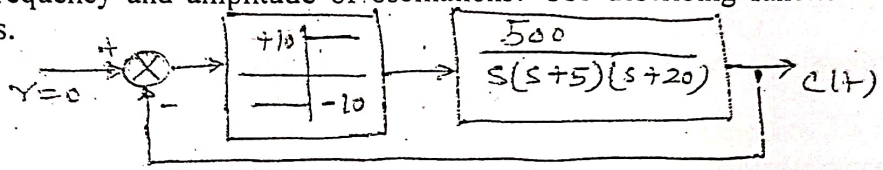


Fig.1

2×5

2 Investigate whether the system shown below exhibits self sustained oscillation? If so what would be the frequency and amplitude of oscillations? Use describing function method of stability analysis. **10**



3[a] For the nonlinear system described by the input output relation

$y = 4\left(\frac{dx}{dt}\right)^2 + 6x + 3x^2\frac{dx}{dt}\right)$,derive the describing function, where y is output and x is input. **05**

[b] Determine the points of equilibrium and using linearization method investigate the stability of the following nonlinear system near each point of equilibrium.. **05**

$$\dot{x}_1 = x_2$$
$$\dot{x}_2 = -x_1 - x_1^2(x_2 - 1)$$

4 [a] Use the Lyapunov direct method to determine the stability of the LTI system described by. **05**

$$\dot{x} = \begin{bmatrix} -1 & 1 \\ -1 & -1 \end{bmatrix}[x] + \begin{bmatrix} 1 \\ 1 \end{bmatrix}[r]$$

[b] Find sign definiteness of the scalar function **05**

$$V(x) = 3x_1^2 + 4x_2^2 + 2x_3^2 + 2x_1x_2 - 4x_2x_3 - 2x_1x_3$$

5 For the following Nonlinear system draw the phase plane trajectory using Delta method and Investigate the stability of the system. **10**

$$\ddot{x} + 0.25\dot{x} + 0.5x^3 + x = 0 \quad , \quad \dot{x}(0) = 4, \; x(0) = 0$$

6. Consider the nonlinear system described as **10**

$$\dot{x}_1 = -x_1 + x_2 + x_1(x_1^2 + x_2^2)$$
$$\dot{x}_2 = -x_1 - x_2 + x_2(x_1^2 + x_2^2)$$

And investigate whether stable, unstable and semi stable limit cycle exist. Use polar coordinates.

7. Use Variable gradient method to construct a Lyapunov function for the system described as:

$$\dot{x}_1 = x_2 \; , \; \dot{x}_2 = -x_2 - x_1^3$$

Show that the origin is a globally stable equilibrium state of the system. **10**

Total Number of Pages 2 Roll No.....

M.Tech Power Systems *1st SEMESTER*

SUPPLEMENTARY EXAMINATION *(Feb-2020)*

PSY-503 Advanced Power Electronics

Time: 3 Hours ***Maximum Marks:40***

Note: Assume suitable missing data, if any
Q.1, Q2 and Q3 are compulsory. Attempt any other 3 from the rest
Attempt all parts of a question at one place (*Marks may not be awarded otherwise*)

1 Giving reasons by explaining (*very briefly*), why?

(i) Cúk and Sepic Converters have both low input and output ripple contents.
(ii) Use of diode rectifier with large DC capacitor for higher capacity of Power is discouraged.
(iii) Boost converter is preferred over Buck converter for PV applications.
(iv) Load voltage and Inverter voltage profile of 3 phase inverter operating with single pulse (120° conduction) are same, and do not contain 3rd harmonics or their multiples, when feeding to 3 phase Y connected load without neutral.
(v) Thyristorised AC-DC converter output power in non-decoupled mode.
(vi) With DC bus voltage of grid connected inverters almost equal to maximum grid voltage (line-line) can support only reactive power.
(vii) Current controlled Voltage Source Inverter (VSI) offer fast & flexible control and grid coupling, vis-à-vis voltage controlled VSI.
(viii) Multilevel inverters offer both higher voltage support along with reduced voltage harmonics. **1x8**

2 [a] Derive the rms value of triangular current. Compute the rms current in an inductor having an average value of 10A and triangular current of 3A peak to peak. **2**

[b] The voltage generated by an array of solar cells connected such that they form V_{dc} of 110V of full bridge thryristorised converter. The solar cells are capable of producing 1000 W. The ac source of 120 V_{rms} is transacting power through a resistance of 0.5Ω, L (*large enough to cause the load current to be essentially dc*) and solar cell array, all connected in series. Determine the delay angle α such that 1000 W is supplied by the solar cell array. Determine the power transferred to the ac system and the losses in the resistance. Assume ideal SCRs. **3**

[c] Quantify the effect of source impedance on the output of single phase thyristorised converter. Derive the expression from the fundamentals. **3**

3 [a] Derive the relationship between input and output voltages for the SEPIC converter using the average voltage across shunt inductor(L_1). Also derive the minimum value of inductor L_1, in addition to the value of C_1 in terms of the ratios of their ripple voltages and output voltage. **3**

[b] Through block diagram, using instantaneous power theory, compute the reference signals for control of VSI for compensation of reactive power alone. 2

[c] A switch has a current fall time t_f of 1.0 μs and is used in a step down chopper. The source voltage and the final voltage across the switch are 120 V, the load current is 6 A, the switching frequency is 100 kHz, and the duty ratio is 0.3. Design a snubber circuit to limit the turnoff loss in the switch to 2 W. Determine the power absorbed by the snubber resistor. 3

4 [a]Draw a neat set of waveforms of 3 phase inverter output, line voltage and load voltage, when feeding a 3phase 3 wire, Y connected load with 180° conduction. Obtain their equations from the fundamentals using fourier analysis. 4

[b] Derive the equation for output voltage using fourier series for 7level cascaded H bridge multilevel inverter operating with single pulse per half cycle by each bridge. For what values of α_1, α_2 and α_3, the output will not have 3rd harmonics. 4

5 [a] A single-phase, full-wave converter is feeding to the load consisting of R=12Ω and L=34mH. The ideal 50Hz sinusoidal supply is depicted as $340\sin\omega t$. Calculate values for the average and rms load currents, the power dissipation and the power factor at the supply terminals if the thyristor firing angle is 30°, considering domination of 2nd harmonic on the load voltage waveform. 4

[b] Derive the equation for current drawn by a 12 pulse converter by adding the currents of two 3 phase (*30 °phase displaced*) pulse converters using fourier series. Show clearly that all triplens and harmonics except 12n±1 vanishes. 4

6 .[a] The flyback converter has an input of 44 V, an output of 3 V, a duty ratio of 0.32, and a switching frequency of 300 kHz. The load resistor is 1Ω. (a) Determine the transformer turns ratio. (b) Determine the transformer magnetizing inductance L_m such that the minimum inductor current is 40 % of the average. 4

[b] Design a buck-boost converter that has a source that varies from 10 to 14 V. The output is regulated at -12 V. The load varies from 10 to 15 W. The output voltage ripple must be less than 1% for any operating condition. Determine the range of the duty ratio of the switch. Specify values of the inductor and capacitor, and explain how you made your design decisions. $f_{sw}=100kHz$ 4

Total No. of Pages :03

Roll No.....

I SEMESTER

M.Tech. [PSY]

SUPPLEMENTARY EXAMINATION *FEBRUARY 2020*

PSY 5303: FLEXIBLE AC TRANSMISSION SYSTEMS

Time: 3:00 Hours *Max. Marks : 50*

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

Q.1[a] Briefly explain, with neat diagrams, how to minimise harmonics occurring due to SVC in power systems. 4

[b] A TCSC is connected in series with a transmission line between two buses '1' and '2'. The transmission line reactance is 0.3 p.u. The TCSC parameters are: X_L=0.004 p.u, X_C=0.04 p.u. The sending and receiving end bus voltages are $V_1 = 0.98\angle 10^0$ and $V_2 = 0.98\angle 4^0$ p.u. Find the power transfer capability of the line-TCSC combination at a firing angle of (i) 110^0 and (ii) 150^0. 6

Q.2[a]A SSSC is connected in series with a transmission line. The SSSC is installed at the line sending end. Derive an expression for the reactive power exchanged by the SSSC converter with the line in the capacitive mode. 4

[b]A lossless STATCOM is connected to a load bus as shown in the equivalent circuit of Fig. 1.

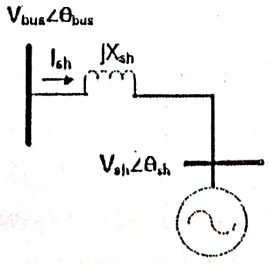


Fig. 1: Equivalent circuit of a STATCOM connected to a load bus

The STATCOM delivers a reactive power of 0.1 p.u. to the bus. The load bus voltage is $V_1 = 0.98\angle 10^0$ p.u while the leakage reactance of the coupling transformer is 0.2 p.u. Compute the STATCOM fundamental output voltage $V_{sh}\angle\theta_{sh}$ and the current magnitude drawn by the STATCOM. 6

Q3. [a] Draw the TCSC reactance vs. firing angle plot. Show on this diagram and explain the different operating modes of the TCSC. 4

[b] A SVC (FC-TCR combination) is connected to a bus whose voltage magnitude is 0.98 p.u. The net SVC currents corresponding to firing angles of 150 and 180 electrical degrees are 0.2 p.u. and 0.25 p.u. Compute the net SVC current at a firing angle of 120 electrical degrees. 6

Q.4[a] Elucidate, with V-I characteristics and P-δ curves, how a STATCOM is better than a SVC. 3

[b] Fig. 2 below shows a lossless UPFC connected at the sending end of a transmission line between buses 1 and 2.

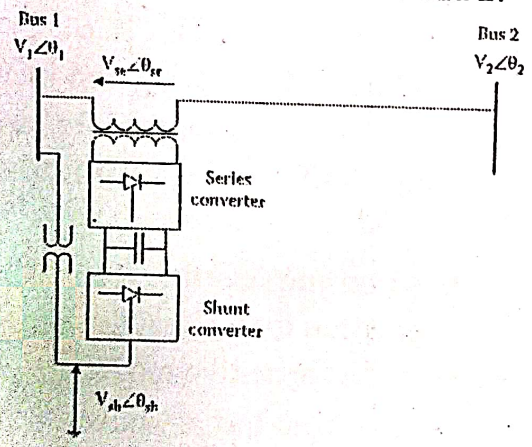


Fig. 2: UPFC connected at sending end of a line

The line reactance is 0.2 pu and the series converter coupling transformer leakage reactance is negligible. The bus voltages at the sending and receiving end are $V_1 = 0.98\angle 10^0$ and $V_2 = 0.98\angle 4^0$ p.u.

(a) If the UPFC transmits 1.1 p.u active power at the receiving end of the line at unity power factor (P_{12RE}=1.1 p.u. and Q_{12RE}=0), find V_{se} and θ_{se}.

(b) If the UPFC shunt converter delivers 0.2 p.u reactive power to the sending end bus, find V_{sh}. Assume shunt coupling transformer leakage reactance as 0.1 p.u. 7

Q.5[a] Explain, with neat diagrams, how a UPFC is better than a SSSC. 4

[b] Draw the three-phase physical connection diagram of a two converter IPFC installed for simultaneous power transmission control of two lines. 6

Q.6 Write short notes on (any two): 2 x 5

[i] Three degrees of freedom of a UPFC

[ii] Q-δ characteristics of a line with SSSC

[iii] UPFC operation with decoupled converters (separate DC links).

-End-

Total No. of Pages – 2

Roll No. .....

FIRST SEMESTER

M.TECH. (POWER SYSTEM)

END SEMESTER EXAMINATION (Supplementary) Feb-2020

PSY-501 ADVANCED POWER SYSTEM ANALYSIS

Time: 3:00 Hours *Max. Marks : 40*

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

Q.1a. The dimensions of a 3-phase, 400 kV delta configuration line are:
Av ht of lower conductors from ground = 13m, Ht of top conductor = 20m, spacing between lower conductors = 15m. Conductors are 2x3.18 dia and B = 45.72cm.
Calculate the inductance matrix for completely transposed line. 4

b. How the presence of ground return resistance and inductance will modify the series impedance matrix of a transmission line. 4

Q2. a. What is d-q-0 transformation? Explain its utility in analyzing a 3- phase system. 4

b. How bus admittance matrix will be modified if a regulating transformer is connected between two buses. 4

Q.3. In the given 3 bus system, $z_{12} = z_{13} = j0.1$, $z_{23} = j0.2$, $z_{1r} = j0.1$, $z_{2r} = j1.25$. Form the Z bus matrix using step by step building procedure. 8

Q.4.a. Decompose the given Y_{bus} matrix into lower and upper triangular matrix and hence determine the 3rd column of Z_{bus} matrix. 4

$$\begin{matrix} -j20 & j10 & j10 \\ j10 & -j15 & j5 \\ j10 & j5 & -j15 \end{matrix}$$

b. Explain 'Kron's reduction technique' for reducing the order of a bus matrix. 4

Q.5.a. A system consists if two plants connected by a transmission line. The only load is located at plant 2. When 200MW is transmitted from plant 1 to plant 2 power loss in the line is 16 MW. Find the required generation for each plant and the power received by the load when cost of eceived power for the system is Rs.12.50 per MW per hour. Assume that the incremental fuel cost can be approximated by: 4

$$(dF_1/dP_1) = 0.01P_1 + 8.5$$

$$(dF_2/dP_2) = 0.015P_2 + 9.5$$

b. In the given 3 bus system, bus 1, 2 and 3 are connected with each other through transmission lines of per unit impedances of j0.1. A generator of impedance j0.25 is connected at bus no. 1 and also at bus no.2. Calculate the voltages at the healthy buses and the current through all the transmission lines when a solid 3-phase fault occurs on bus 3. Assume prefault voltages as 1pu. 4

Q.6. Consider a 3 bus system, with all the buses connected with each other through transmission lines. The specifications at various buses are given in tables below. Find voltages at buses 2 and 3 using N-R method after first iteration. 8

Buse code	Admittance
1 - 2	2 - j8
1 - 3	1 – j5
2 - 3	1 – j4

Bus no.	Type	Volt, pu	Angle, δ	Injected Real power, pu	Injected reactive power, pu
1	Slack	1.04	0	-	-
2	P-Q	?	?	- 0.2	- 0.2
3	P-Q	?	?	- 0.1	- 0.3

Q.7. Write short notes on (any TWO): 4x2 = 8

i. Swing Equation and its application in power system
ii. FDLF method for load flow analysis
iii. Modal Theory' and significance of different modes of propagation

Total No. of Pages :01 Roll No.....

SEMESTER-3rd M.Tech(SPDD)

SUPPLEMENTARY EXAMINATION Feb-2020

EC-7223 Machine Vision

Time: 3.0 Hours Max. Marks : 100

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

Q. No. 1 (a) Derive the expression of o/p of a decimator. Show the frequency response. (10 M)

(b) How do we avoid aliasing in a Quadrature Mirror Filter? (10 M)

Q. No. 2 (a) Write an algorithm for Convex Hull. (8 M)

(b) Write an algorithm to detect quadrant of a circle. Explain mathematically. (12 M)

Q. No. 3 (a) Write the difference between Laplacian , Hessian and Plassey Detectors. (12 M)

(b) Write Maximum Likelihood algorithm to compute Probability of Error in a binary image having white gaussian noise. (8 M)

Q. No. 4 (a) How do intrinsic and extrinsic parameters matter in Camera Calibration? Prove Mathematically?. (10 M)

(b). Write about the Mixture Model. (4 M)

©. Write about any Motion Detection Algorithm. (6 M)

Q. No. 5(a) Write in detail about the Optical Flow method. Where is it used? (10 M)

(b) Compare Chi-Square distribution with t-distribution mathematically. (10 M)

Q.No. 6 Write Note on the following:

(a) SIFT (7 M)

(b) Kalman Filter (7 M)

© Thresholding and Lateral Histogram (6 M)

Total No. of Pages:2

Roll No. .....

M.Tech. (SP&DD)

FIRST SEMESTER

END SEMESTER EXAMINATION [SUPL.] *(FEB-2020)*

SPD-

[redacted]- 5303 Wavelet in Signal Processing

Time: 03 Hours

Max. Marks: 50

Notes:-

1. Answer any *FIVE* questions.
2. Assume suitable missing data, if any.

1[a] What are the non-stationary signals? What is the importance of non-stationary signals in case of biomedical signals? **(4)**

[b] Compare wavelet transform with STFT. Explain effect of window function width on STFT of non-stationary signals. **(6)**

2[a] Explain all essential and desirable properties of wavelet function. **(4)**

[b] What is function of thresholding technique in DWT? What are the different types of thresholding technique? Explain. **(6)**

3[a] Draw and explain structure of Dual Tree Complex DWT. Write all conditions related to analysis and synthesis filter design, advantages and disadvantages of Dual Tree Complex DWT. **(5)**

[b] Draw standard **ECG** waveform with different peaks/waves, segments and interval. Explain different variables used in the classification of **EEG** activity. **(5)**

4[a] Calculate different energy components of Haar transform (ε_a^1, ε_d^1, ε_a^2, ε_d^2, ε_a^3 and ε_d^3) for signal f (2, 6, 10, 8, 4, 3, 2, 6). **(6)**

[b] Explain different **ECG** and **EEG** artifacts in terms of their source, frequency range, relative amplitude, waveform and effect on ECG/EEG waveform. **(4)**

Q.5 Explain mother wavelet function, scaling function, analysis & synthesis filter bank and properties of following wavelets:- **(10)**

I. Biorthogonal Wavelet
II. Maxican Hat Wavelet
III. Symlet Wavelet
IV. Gaussian Wavelet

6[a] What are the kernel and laguerre function for the poisson transform? Explain admissibility condition of poisson wavelet transform. **(6)**

[b] What are the different gain parameters used for comparison of wavelet performance? **(4)**

Roll No.....

FIRST SEMESTER M.TECH. (ENE)
SUPPLEMENTARY SEMESTER EXAMINATION FEB. – 2020
ENE- 5301 ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

Time: 03 Hours *Max. Marks: 40*

Note: *Attempt any five questions*
Assume suitable missing data if any

1. a) Describe the concept and components of aquatic chemistry. 04
   b) Briefly discuss unique properties of water and their environmental significance. 04

2. a) Differentiate between soaps and detergents. What are the environmental problems associated with detergents. Discuss. 04
   b) Define heavy metals. Why are the heavy metals of environmental concern? Explain. 04

3. a) Explain the mobility and fate of pesticides in environment. 04
   b) Discuss the chemistry of CFCs and their role in catalytic destruction of ozone. 04

4. Write short notes on
   a) Eutrophication 2
   b) Redox reactions 2
   c) Tricking filter 2
   d) Biogas 2

5. a) Compare the aerobic and anaerobic microbial transformation of carbon. 04
   b) Briefly discuss acclimatisation of waste. 04

6. a) Describe the key phases of microbial growth and dynamics. 04
   b) Discuss the role of fungus in lignin degradation. 04

7. a) What is green house effect? Define green house gases. What are the environmental consequences of global warming? Discuss. 04
   b) What are biofilters? Explain the working and environmental benefits of biofilters. 04

Total no. of Pages 02

1st (F/T) Semester & 3rd Semester (P/T) (Old Scheme) Roll no.....

END TERM SUPPLIMENTARY EXAMINATION M.Tech. [THE]

Feb-2020

ME-561 ADVANCED HEAT AND MASS TRANSFER

Time 3hrs

Marks: 100

Attempt Any Five Questions

Q-1(a)A person is found dead at 5 am in a room, the temperature of s which 20 (°C). . The temperature of body is 25 (°C) , when found and heat transfer coefficient is estimated to be 8 w/m^2°C. Assume the human body of 30 cm dia and 170 cm long cylinder has 72% of water by mass. Assume its properties of water at room temperature. (Density-1000 kg/m^3), Cp=4180 J/KgK, K=0.608 W/mK. Assume human body temperature is 37(°C). Estimate the time of Death of above person. (12)

(b) Derive the expression for temperature distribution and rate of heat transfer, and heat energy stored using lumped parameter capacity method. (8)

Q2 Derive the expression for critical thickness of insulation for (i)sphere and (ii) cylinder. State the condition for optimality. Assume inner and outer convection also. (7+7)

(b) A Rectangular duct of size (400mm X 300mm) carries air at 25 (°C) to the room. The velocity of air is 600m/min. find the inside heat transfer coefficient, if the heat transfer coefficient on the outer surface of the duct is 20 (W/m^{2}K) and temperature of the atmosphere surrounding the duct is 10 (°C). Find the heat lost by the air per metre length of the duct. Neglect the resistance of the duct wall. The properties of air at 25 (°C) are : Density (Kg/m^3)=1.02, Specific Heat(J/Kg/K)=1000, Thermal conductivity (W/mK)=0.0256, Viscosity (Kg/m-sec)=0.0000182 (6)

Q3(a). Why fins are used. Define Fin efficiency and Fin Effectiveness. Derive the expression for rate of heat transfer when (i) fin is not insulated and (ii) fin is insulated (iii) fin is too long. (7+7+6)

Q(4): An Al pipe carries steam at 110 (°C) the pipe has thermal conductivity of 185 W/mK has an inner diameter of 10 cm and an outer diameter of 1.2 Cm. The pipe is located in a room when the ambient air temperature is 30 (°C) and convective heat transfer coefficient is 1500 (W/m^{2}K). determine the rate of heat transfer per unit length of pipe. (6)

(ii) To reduce heat loss from the pipe, it is covered with 5 cm thick layer of insulation (K= 0.2 W/mK). determine the rate of heat transfer per unit length of pipe. (5)

(b)Define following terms with physical significance:
Thermal Diffusivity, Biot Number, Fourier Number, Geometric Number , Shear wood Number, Schmid Number, Prandtl Number, Nussult Number, Stanton Number (9)

Q-5. (a) Oil is being cooled by water in a tube parallel flow type heat exchanger. Water enters the centre tube at 16 (°C)and is heated to 50(°C). The oil flow in annulus and cooled from 130 (°C) to 60 (°C).

Find (i) The exit temperature of each fluid, if the existing heat exchanger was swatted to counter flow operation (ii) The minimum temperature to which oil may be cooled by increasing the tube length with (a) parallel flow operation and (b) Counter flow operation. (iii) The maximum possible effectiveness in (a) Parallel flow operation (b) Counter flow operation. Also find outlet the temperature of hot fluid and cold fluid also. (10)

(b) Derive the expression for the effectiveness of heat exchanger in counter flow arrangement. (10)

Q6(a) Derive the expression for rate of heat exchange between two surface and verify reciprocal theorem. (8)

(b) Determine the geometric shape factor for a very small disc dA_1 and large parallel disc A_2 located at a distance L directly above the smaller one .(Both are placed in horizontal plane). (12)

Q-7(a) A tube of 30 mm inner diameter is maintained at 100 (°C) and water at 20 (°C) is passed through the tube with a velocity of 0.5 (m/sec) and heated to 60 (°C). Assume : density of water at temperature of 40 (°C) as: Density (Kg/m^3)=1000, Specific Heat(J/Kg/K)=4200, Thermal conductivity (W/mK)=0.63, Viscosity (Kg/m-sec)=0.00065. Find the amount of heat transferred to the water, convective heat transfer coefficient and length of the tube. (6)

(b) Discuss the resume of boiling (4)

(c) Derive the expression for thickness of boundary layer in vertical plate condensation. (8)

END

Total No. of Pages _03

Roll No.....

IInd SEMESTER

B.Tech./M.Tech./MBA/Ph.D/ B.Tech. (Evol

END SEMESTER (Supplementary) EXAMINATION

Feb -2020

PAPER CODE ME-551 & TITLE OF PAPER: Plasticity & Metal Forming

Time: 3:00 Hours ***Max. Marks : 100***

Note : Answer 5 questions in total by Selecting any all parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] At 8% and 18% elongation the loads on a tensile test piece of tempered aluminium alloy are 1.59kN and 1.66kN respectively. The test piece has initial width of 12.5mm, thickness of 1.4mm and gauge length of 50mm. Determine the 'n' and 'k' values if the material obeys power law of strain hardening. [10]

[b] Three principal stresses are applied to a solid where σ_1=400MPa, σ_2=200MPa, and σ_3=0, then determine the followings:

(i) What is strain ratio [$d\epsilon_1/ d\epsilon_3$] [2]

(ii) If a fluid pressure produces an all around compressive hydrostatic stress of 250MPa, superimposed on original stress state, how does the strain ratio change? [3]

(iii) Find effective stress. [2]

(iv) Find effective strain in terms of principal strain (ϵ_1). [3]

Q.2[a] The plastic flow behaviour of a material is given by $\sigma = 800\epsilon^{0.22}$MPa. *Bar-A* of this material was first cold worked to reduce the area of cross section by 25%, followed by additional cold work of 30%. Another *bar-B* of the same material was cold

worked to reduce the cross section by 55%. After cold working which of the two bars will have higher yield strength? [10]

[b] For the case of **equibiaxial tension** show that at the point of instability, effective strain is twice the strain hardening exponent. [10]

Q.3[a] Determine the drawing force required to produce a 20% reduction in a 10mm diameter steel wire if the flow stress is given by $\sigma = 1300\,\epsilon^{0.3}$ MPa. The die angle is 12° and $\mu = 0.9$.

i. If the wire is moving through the die at 3 m/sec, determine the power required. [5]

ii. What is the maximum possible reduction under these conditions? [5]

[b] Neglecting the friction , derive an expression for draw stress in a wire drawing operation to achieve reduction in area , r. Also show that the maximum possible reduction in this case is 63%. [10]

Q.4The stress state at a point is given by following components of stress tensor:

$$\sigma_{ij}=\begin{pmatrix}70 & 30 & 25\\ 30 & 80 & 40\\ 25 & 40 & 90\end{pmatrix}\text{MPa}$$

a) Determine the normal stress on octahedral plane whose normal has the direction cosines: $1/\sqrt{3}$, $1/\sqrt{3}$, & $1/\sqrt{3}$ with the principal axes. [6]

b) Determine the total shear stress on the above plane. [4]

c) If the yield strength of the material is 120MPa, determine whether the material yields as per Von Mises and Tresca. Find the factor of safety on yield. [10]

Q.5 A cylindrical cup with an inside radius 30 mm and height of 80 mm is to be drawn from a blank of thickness 3 mm. A blank holder force of 53 kN is applied. If the uniform axial yield stress of the

material is 360 MPa ,determine (a) The drawing force required (ignoring strain hardening) assuming coefficient of friction to be 0.1 (b) Limiting draw ratio (c) Determine the draw force required for data given in problem if the material strain hardens according to the power law of hardening $\sigma_o = (360+50\ \epsilon^{0.5})$, also calculate the limiting draw ratio. [20]

Q.6 [a]. Derive an expression for estimating spring back in a plane strain bending operation ignoring strain hardening. Show the residual stress distribution after the load is released. [10]

[b]. A steel sheet of 1mm thickness and 50mm width is bent under plane strain conditions over a tool having radius of curvature of 125mm. The material follows stress strain curve given by:

[$\bar{\sigma}=510\bar{\epsilon}^{0.28}$] MPa. *(Where $\bar{\sigma}$ and $\bar{\epsilon}$ are effective stress and strain respectively), E=200GPa, Poisson's ratio=0.3* and coefficient of friction (μ) = 0.125. Then solve the followings:

(i) If the above bending operation is done on V bending Die with a die opening width of 100mm, what is the max force required?

(ii) If the elastic portion is considered in the above problem, what fraction of thickness will remain elastic?

(iii) What %age error does neglecting the elastic core cause in the calculation of the bending moment? [10]

Q.7 What is forming limit diagram? Draw a typical Forming limit diagram. Explain the formability of a sheet metal with reference to:

a) Strain hardening coefficient

b). Normal and planar anisotropy

c) Yield strength

d) Grain size

[20]