QUESTIONS PAPERS
SUPPLEMENTARY EXAMINATION
FEBRUARY- 2019

B.TECH and B.TECH. (EVENING)
1st, 3rd, 5th & 7th SEMESTER

M.TECH (FT/PT)
1st & 3rd SEMESTER

****

I.TECH. (FT&PT) SUPPLEMENTARY EXAM: FEBRUARY-2019

	Departments	Code	I Sem (FT/PT)& III Sem. PT)	III Sem (FT) & V Sem (PT)
			Page No.	Page No.
	Applied Chemistry (AC)	AC	-----	-----
	Applied Mathematics(AM)	AM	-----	-----
	Applied Physics (AP)	AP	-----	-----
	Bio Technology (BT)	BT	-----	267
	Civil Engineering(CE)	CE	268-277	278-279
	Computer Science & Engg.(CO)	CO	280-283	-----
	Information Technology (IT)	IT	284	-----
	Electrical Engineering(EE)	EE	285-292	293-294
	Electronics & Communication	EC	295-312	313-315
	Humanities (HU)	HU	-----	-----
	Mech. Engineering(ME)	ME	317-323	-----
	Software Engineering (SWT)	SWT	-----	-----

Total No. of Pages: 02 *Roll No.....*

FIRST SEMESTER **M.Tech. (CE)**

Supplementary Examination *Feb. 2019*

ADVANCED MATHEMATICS & NUMERICAL TECHNIQUES

CE-501

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

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

Q.1 [a] Test the consistency and solve

$x + 2y + z = 3;\ 2x + 3y + 2z = 5;\ 3x - 5y + 5z = 2.$

[b] Find the inverse of the matrix using elementary transformation

$$\begin{bmatrix} 2 & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix}.$$

Q.2 [a] Find the general solution in series of differential equation

$$4x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0.$$

[b] Show that $J_{-5/2}(x) = \sqrt{\frac{2}{\pi x}}\left[\frac{3}{x}\sin x + \frac{3-x^2}{x^2}\cos x\right]$.

Q.3 [a] Estimate the values of $f(22)$ and $f(42)$ from the following data.

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

[b] Probability distribution function values of a normal distribution are $P(0.2)=0.39104$; $P(0.6)=0.33322$; $P(1.0)=0.24197$; $P(1.4)=0.14973$; $P(1.8)=0.07895$. Find the value of $P(x)$ at $x = 1.2$ using Bessel's formula.

Q.4 [a] Show that the expression $A(i,j,k)$ is a tensor if its inner product with an arbitrary tensor B^{jl}_{k} is a tensor.

P.T.O.

[b] Define contravariant tensor of rank two. Show that the Kronecker delta is a mixed tensor of order two.

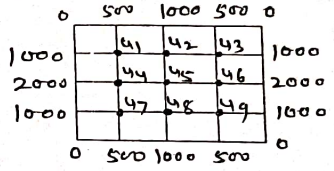
Q.5[a] Evaluate $\int_0^{0.6} e^{-x^2}\,dx$ using Simpson's 1/3rd rule.

[b] Find the first derivative of f(x) at x=1.5 if

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.000	13.625	24.000	38.875	59.000

Q.6 [a] Using Runge-Kutta 4^{th} order method, solve $\frac{dy}{dx} = x + y^2$, for $y(0.2)$, given that $y(0) = 1$.

[b] Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the domain of the figure given below up to third iteration.



Q.7 [a] (i) Prove that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1+\frac{\delta^2}{4}}$.

(ii) Prove that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$.

[b] Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials.

-268-

Total No. of Pages1 Roll No. .....

FIRST SEMESTER M.Tech. (Structure Engineering)

SUPPLEMENTARY EXAMINATION February - 2019

CE-502 ADVANCED THEORY OF STRUCTURES

Time: 3:00 Hrs. Max. Marks: 100

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

1. Find out equivalent joint load vector for a plane frame member of 4.5 m long. The symmetrical trapezoidal load having ordinates of 0 and 40 kN/m at the ends and 2.25 m from the ends respectively. (20)

2. Explain the applicability, merits and demerits of a framed tube structure system used in tall buildings. (20)

3. Write down stiffness matrix for a grid frame member with reference to member axis system. (20)

4. Determine rotation transformation matrix for a space truss member, which connects two ends of a member having coordinates (2,3,4) and (7,8,9). (20)

5. Explain the procedure for non-linear elastic analysis of a rigid jointed frame. (20)

6. Determine stiffness matrix of a curved beam element, which is subtending an angle of 30^0 at its centre. The ratio of GJ/EI may be taken as 0.8. The structure and loading planes are mutually perpendicular. (20)

END

Total No. of pages 03

Roll No._____

I st SEMESTER

M.Tech.[Civil Engg.(STR. ENGG.]

Branch/ Group code

END SEMESTER SUPPLEMENTARY EXAMINATION ~~NOV.~~ Feb. 2019

CE503 FINITE ELEMENT METHOD OF STRUCTURAL ANALYSIS

Paper Code Title of the Subject

Time: 03 Hours Max. Marks: 100

Note: Question 1 and 2 are compulsory. Attempt any one from the remaining questions. Assume suitable missing data if any.

Q.1 Answer all five parts of the following: [5 x 10 = 50]

a) Assuming a single dof at each node, use following generalized displacement coordinate model $u(x,y) = \alpha_1 + \alpha_2 x + \alpha_3 y + \alpha_4 xy$ and compute the [A] matrix for the square element shown in figure 1 below.

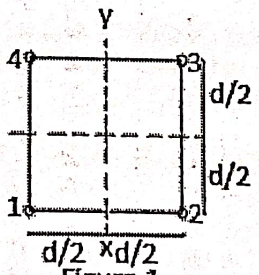


Figure 1

b) Check the following plate bending displacement model for completeness and geometric isotropy

$$w = \alpha_1 + \alpha_2 x + \alpha_3 y + \alpha_4 x^2 + \alpha_5 xy + \alpha_6 y^2 + \alpha_7 x^3 + \alpha_8 x^2 y + \alpha_9 y^3$$

c) Develop the shape functions for all the nodes using natural coordinates for the line element shown in figure 2 below.

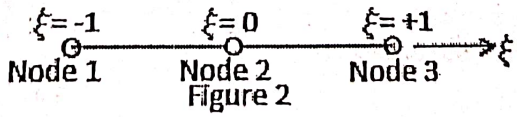


Figure 2

d) Explain/derive the virtual work formulation of stiffness matrix and load vector.

-270-

e) Explain the convergence requirements for the displacement field models.

Q.2 Attempt any three of the following: [3 x 10 = 30]

(a) For a 2 noded truss element oriented along member axes, develop the Stiffness Matrix. Adopt one-point GQR. Take AE constant. Use displacement field model based on natural coordinates.

(b) Write the shape functions for a beam element with two dofs at each node using Hermitian polynomials.

(c) Determine the functional governing the static buckling of a both end pinned column subjected to axial load P and specify the essential boundary conditions.

(d) Obtain the sampling point locations and weight factors for a two-point Gauss quadrature rule using Lagrangian interpolation polynomial.

Q. 3 Analyze the 2D plane stress deep beam problem and attempt as follows:

a. Write constitutive relationship.

b. Write strain displacement relationship

c. Select a suitable C^0 continuity generalized coordinate displacement model for a triangular element and test its suitability for compatibility and completeness requirement.

d. Develop [A} matrix

e. Determine [N] vector.

f. Get [B] matrix

[a: 02+b:02+c:03+d:03+e:05+f:05 = 20]

Q. 4 Analyze a plane strain problem using a 4 noded quadrilateral c^0 continuity element using a parent iso-parametric rectangular element in local coordinates to evaluate the Jacobian and the stiffness matrix following steps as follows. The element is as shown in figure 3 below.

a. Write shape functions for all the nodes.

b. Develop the Jacobian matrix and evaluate at Gauss point 1. The 2x2 GQR is to be applied for obtaining the stiffness matrix.

c. Develop [B] matrix for Gauss point 1.

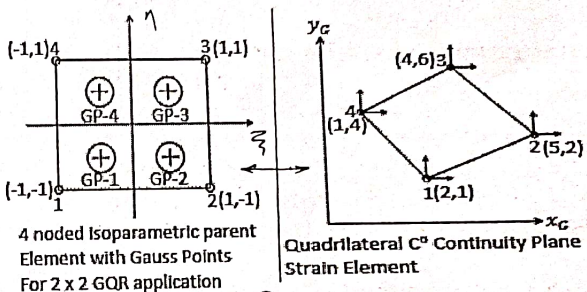


Figure 3

[a: 04+b:08+c:08= 20]

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

FIRST SEMESTER M.TECH. (ENV)

SUPPLEMENTARY EXAMINATION FEB 2019

CE-511 ADVANCED MATHEMATICS

Time: 3 Hr Max. Marks: 100

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

1. a) Use Newton's method to find the smallest root of the equation $e^x = x^3 + \cos 25x$ to four places of decimal.

   b) Using Gauss elimination method solve

   $$5x_1 + x_2 + x_3 = 7$$
   $$x_1 + x_2 + 6x_3 = 8;\ x_1 + x_2 + x_3 = 3$$

   c) Solve the following equations by Gauss-Seidal method:

   $$10x_1 - 2x_2 - x_3 = 10;\ -2x_1 + 10x_2 - x_3 = -14$$
   $$-x_1 - x_2 + 10x_3 = 20$$

2. a) Using Euler's method solve $y^{\wedge\prime} = x + y + xy, y(0) = 1$ and find $y(0.1)$ by taking $h = 0.025$

   b) Using R-K method, solve $y' = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$.

   c) Solve the boundary value problem for $x = 0.5$:

   $$y'' + y + 1 = 0, \qquad y(0) = y(1) = 0,$$

   using finite difference method.

3. a) Calculate the correlation coefficient and the lines of regression from the following data:

x	57	58	59	59	60	61	62	64
y	77	78	75	78	82	82	79	81

   b) A controlled manufacturing process is 0.2% defective. What is the probability of taking 2 or more defectives from a lot of 100 pieces? (I) By using binomial distribution. (II) By using Poisson approximation.

   c) In a large institution 2.28% of employees receive income below Rs. 4500 and 15.8% of employees receive income above Rs. 7500 p.m. Assuming the income follows normal distribution. Find the mean and S.D of the distribution.

4. a) The nicotine content in milligrams of two samples of tobacco were found to be as follows:

Sample A	24	27	26	21	25	
Sample B	27	30	28	31	22	36

   Can it be said that two samples come from the same normal population ($F_{0.05} = 2.26, F_{0.05} = 6.26$).

   b) The following figures show the distribution of digits in numbers chosen at random from a telephone directory.

Digits	0	1	2	3	4	5	6	7	8	9
frequency	1126	1107	997	966	1075	933	1107	972	964	853

   Test whether the digits may be taken to occur equally frequently in the directory ($\chi^2_{0.05} = 16.919$)

   c) Two groups of 100 people each were taken for testing the use of a vaccine 15 persons contracted the disease out of the inoculated persons, while 25 contacted the disease in the other group. Test the efficacy of the vaccine using χ^2 value ($\chi^2_{0.05} = 3.184$).

5. a) Using graphical method solve the following LPP:

   Minimize $z = 2x_1 + 3x_2$ s.t

   $$x_2 - x_1 \geq 2;\ 5x_1 + 3x_2 \leq 15; 2x_1 \geq 1; x_2 \leq 4,$$
   $$x_1, x_2 \geq 0$$

   b) Solve the following LPP by simplex method:

   $$\text{Maximize } z = 3x_1 + 2x_2 + 2x_3 \text{ s.t.}$$
   $$2x_1 - x_2 + 3x_3 \leq 18; x_1 + x_2 + 2x_3 \leq 12;\ x_1, x_2, x_3 \geq 0.$$

   c) Solve the following LPP by simplex method:

   $$\text{Maximize } z = 5x_1 + 3x_2 + 3x_3 \text{ s.t.}$$
   $$4x_1 + 4x_2 + 3x_3 \leq 12000; 0.4x_1 + 0.5x_2 + 0.3x_3 \leq 1800;$$
   $$0.2x_1 + 0.2x_2 + 0.1x_3 \leq 12000;\ x_1, x_2, x_3 \geq 0.$$

-272-

Total No of pages: Roll No _____

M.Tech/Ph.D (HWRE) First SEMESTER

SUPPLEMENTARY EXAMINATION (FEBRUARY 2019)

CE 533 Advanced Open Channel Hydraulics

Time : 3:00 Hours Maximum Marks : 100

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

1) A trapezoidal channel having bottom width 8m and side slopes 1:1 carries a discharge of 80 m^3/Sec. Find the depth conjugate to initial depth of 0.75m before the jump. Determine the energy losses in the jump. (10)

2) Explain in detail with figures, various methods of control of jumps?. Also write the applications of hydraulic jump. (10)

3) Explain the various GVF profiles and mention their features. (10)

4) Plot the specific energy curve for a rectangular channel 5m wide carrying 10 cumecs. The maximum depth of flow in the channel is to be 3m. Determine the following from the curve.

a) Minimum specific energy

b) Alternate depths corresponding to a specific energy of 2.5 kg-m/kg.

c) The critical depth of flow

Also verify your results using analytical means. (15)

5) A 1.5 m wide rectangular channel carries a discharge of 5.0 m^3/sec at a depth of 1.5m. At a section the channel undergoes transition to a triangular section of side slopes 2H:1V. If the flow in the triangular section is to be critical without changing the upstream water surface, Find the location of the vertex of the triangular section relative to the bed of rectangular channel. What is drop/rise in the water surface at the transition? Assume zero energy loss at the transition. (15)

6) A 1.8 m wide rectangular flume carries 1.8 m^3/sec of water. At a certain section A, the depth of water is 1m. If the bed slope of the channel is 0.0004, determine the distance from A to a section where the depth is 0.8 m. Solve by single step method. n = 0.013. Is the surface profile backwater curve or drawdown curve? Name the profile. (20)

7) A trapezoidal channel having 6 m wide at bottom, 2H: 1V side slope, bed slope 0.0016 and n=0.025 carries a discharge of 11.3 m^3/sec. Compute the backwater profile created by a dam which backs up the water to a depth of 1.52 m immediately behind the dam. The upstream end of the profile is assumed at a depth of 1% greater than the normal depth. (20)

Total No. of Pages 3

Roll No.....

FIRST SEMESTER

M.Tech. CIVIL

SUPPLEMENTARY EXAMINATION FEB-2019

CE- 532 ADVANCED HYDROLOGY

Time: 3 Hours

Max. Marks : 100

Note : Question 1 is compulsory. Attempt 10 more questions. Assume suitable missing data, if any.

1 Answer Ten parts of the question

[a] Write basic equations used in Lumped flow routing and in Distributed flow routing techniques.

[b] State the method of flow routing used as short term method of forecasting for the Yamuna water level in Delhi.

[c] Compare the applicability of simplified models of Hydraulic flood routing techniques. Which of these models do you propose for flood routing in upper reaches of hilly terrains?

[d] Differentiate between Explicit and Implicit schemes of Kinematic wave routing with the help of relevant equations.

[e] Which model of flood routing do you propose for flow routing through a meandering river in its flood plains? Comment on applicability of lumped flow models in these rivers.

[f] Write a short note on applications of Maximum Intensity-Duration-Frequency relationship in Hydrology.

[g] Compare annual flow time series generation with monthly flow time series generation for a river.

[h] Explain in brief applicability of different modelling approaches in Hydrology. How do you test the model before using it for data generation?

[i] Write a brief note on application of ARIMA and ARMA models in Hydrology. Give one example of each of them.

[j] Enlist few examples where regression analysis is used successfully in Hydrology.

[k] Write a brief note on flood discharge estimation by moving boat method.

[l] Write a brief note on structural methods of flood management.

(4x10)

1251

2 A rectangular parking lot is 140 m x 280 m long. The time of overland flow across the pavement to the longitudinal gutter along the centre is 18 minutes and the estimated total time of concentration to the down stream end of the gutter is 24 minutes. The runoff coefficient is 0.9. If rainfall of intensity 6 cm /hr falls on the lot for 3 minute and stops abruptly, determine the hydrograph upto its peak magnitude. (6)

3 Analysis of annual flood series of a river yielded a sample mean of 1100 m^3/sec and standard deviation of 500 m^3/sec. Estimate the design flood of a structure on this river to provide 90% assurance that the structure will not fail in next 60 years. Use Gumbel's method and assume the sample size to be very large. (6)

4 A basin has 400 km^2 of area L=35 km, LCA=11km. Assuming $C_t = 1.5$ and $C_p = 0.7$, develop a 3 hour synthetic unit hydrograph. (6)

5 For a sub basin of area 280 km^2, the following values of Nash model coefficients were found to be appropriate : n = 3.1, K = 1.8 hrs. Determine the coordinates of 1hr UH at 3 h interval up to its peak values of the discharge. (6)

6 Flood-frequency computations for a river by using Gumbel's method, yielded the following results:

Return period T (years)	Peak flood (m^3/sec)
50	40,810
100	46,300

Estimate the flood magnitude in this river with a return period of 500 years. (6)

7 A drainage basin has 160 km^2 area, 7 hours time of concentration and 9 hours as storage constant with the following information about inter-isochrone area distribution, determine 1 hour unit hydrograph. (6)

Time (h)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Inter isochrones Area (km^2)	10	22	36	43	35	10	4

8 The following are the data of the monthly ground water table fluctuations, precipitation and ground water pumping in certain area. Obtain a regression relation and correlation coefficients (6)

Months	1	2	3	4	5	6	7	8	9	10	11
Precipitation	30	52	95	90	200	280	168	51	18	27	52
Ground WT	3.60	4.05	4.12	4.57	4.8	4.95	5.02	4.80	4.42	4.20	3.90
GW pumping rate	14.0	23.4	32.4	51.2	62.3	79.5	61.4	47.4	34.4	18.9	1.80

9 From the following data of annual runoff depths in cm over a catchment, find if there is any trend in the data. Remove the trend by moving average method.
36, 43, 44, 40, 35, 39, 41, 47, 45, 49, 52, 58. (6)

10 Based on river flow data at a site for 10 years the following equation for Thomas- Fiering model for months of December and January was found applicable. (6)
$Q_{Dec} = 12.2 + (0.14)(Q_{Nov} - 81.2) + t_i 15.31 (1 - 0.958^2)^{1/2}$
$QJan = 0.80 + (-0.05)(Q_{Dec} - 12.2) + t_i 1.96 (1 - 0.039^2)^{1/2}$
Generate the probable flow sequence for next 3 months.

11 During a flood the water surface at a section in a river was found to increase at a rate of 11.5 cm/h. The slope of the river is 1/3300 and the normal discharge for the river stage read from a steady rating curve was 150m^3/s. If the velocity of flood wave can be assumed as 2.5 m/s, determine the actual discharge. (6)

12 Write a brief note on application of Implicit dynamic wave model in Hydraulic flood routing. (6)

END

No. of pages: 01 Roll No.:.....

M.Tech (STRUCTURAL ENGINEERING)

CIVIL ENGINEERING FEBRUARY 2019 (Supplem.)

CE 551 THEORY OF PLATES & ELASTIC STABILITY

TIME: 3 Hours MM.: 100

Note: Attempt any FIVE questions. Assume any missing data suitably. Marks allotted to questions are written opposite to them.

1 Derive the differential equation for the deflection curve in the case of cylindrical bending of rectangular plates. Explain how stresses in such plates are determined. 20

2 Explain the concept of effective length of columns. Discuss the use of design curves for columns. Supplement your answer with neat sketches. 20

3 Show that directions of zero slope and maximum slope are perpendicular to each other in pure bending of plates. 20

4(a) Discuss the differences in the form of deflection patterns in the cases of rectangular plates subjected to uniform loading on the entire area for cylindrical or one way bending. In one case the supports are simple hinged supports and in the other case those are fixed supports. Other parameters remain the same for both the plates. 10

(b) Explain the stress strain curve of mild steel in detail with a neat sketch. 10

5 Determine the critical load for a column whose both ends are in a hinged condition. Use standard notations and state the assumptions used. 20

6 Discuss bending of a circular plate. The plate is subjected to a uniformly distributed load on its entire area and rests freely on its circumference. 20

7. Write short notes on any two of the following topics. 20

(a) Determinate structures

(b) Ductility of steel

(c) Plates on elastic foundations

Total No. of Pages: 2

Roll No.....

END SEMESTER EXAMINATION: February – 2019 (Supplementary)

CE 7221: Earth Pressure & Earth Retaining Structure

Max Marks: 100 **Time Allowed: 3 hours**

NOTE: Attempt any FIVE questions. Marks carried by a question are indicated against it. Assume any data suitably, if missing.

1. (a) A smooth vertical wall 5 m high, supports a saturated cohesive backfill ($\varphi=0$) with horizontal surface. The top 3 m of the backfill weighs 17.6 kN/m^3, and has an apparent cohesion of 14 kN/m^2. The bulk unit weight and apparent cohesion of the bottom 2 m of the backfill are respectively 19.2 kN/m^3 and 20 kN/m^2. Determine the likely depth of tension cracks behind the wall. If tension cracks develop, what will be the total active pressure? Sketch the pressure distribution diagram and locate the point of application of the resultant pressure. **(11)**

   (b) Describe various pressure envelops used to estimate earth pressure in braced cuts. Also describe the procedure to calculate strut loads. Describe, how the pressure envelope for cuts in layered soil shall be prepared. **(9)**

2. (a) Explain "Arching in Soils". Explain Terzaghi's theory for vertical stress on an yielding long narrow strip for cohesive and cohesionless soils respectively. **(10)**

   (b) An anchored sheet pile wall penetrates pure saturated clay while the backfill is cohesionless. Draw the earth pressure diagram and analyse the stability of the wall. Also derive expression for maximum bending moment in the wall. **(10)**

3. (a) A cantilever sheet pile wall penetrates pure saturated clay while the backfill is cohesionless. Determine expressions for lateral pressure intensities at important locations and draw the earth pressure diagram. What is limiting height of the wall? Also derive expression for maximum bending moment in the wall. **(10)**

   (b) Derive the expression for coefficient of active earth pressure under Rankine conditions for a sloping backfill for a cohesionless soil. What will be the expression for passive earth pressure? **(10)**

4. (a) Derive with neat sketches the expression for coefficient of active earth pressure under generalised Coulomb's conditions. **(13)**

   (b) Describe with neat sketches various types of joints, and drainage provisions in retaining walls. **(7)**

5. (a) The height of a steel cantilever sheet pile wall above the dredge line is 5m; it retains a cohesionless soil throughout the backfill having $\gamma=16.2$ kN/m^3, and $\varphi=33°$. Determine (i) the theoretical depth of embedment, and (ii) the minimum section modulus of the sheet pile, use $\sigma_{all}=172$ MN/m^2. **(13)**

   (b) What is lateral earth pressure at rest? Describe various expressions to determine the at-rest earth pressure coefficient. **(7)**

6. (a) The height of an anchored sheet pile wall above the dredge line is 9m, and the anchor is situated at a depth of 1.5m from top. The sheet pile is retaining a cohesionless soil throughout having $\gamma=16.1$ kN/m^3, and $\varphi=31°$. Use free earth support method to determine: (i) the theoretical depth of penetration, (ii) the anchor force, and (iii) the maximum bending moment in the sheet pile. **(12)**

(b) Classify and differentiate clearly with the help of neat sketches, the various types of underground conduits. (8)

7. (a) The height of an anchored sheet pile wall above the dredge line is 9m, and the anchor is situated at a depth of 1.5m from top. The sheet pile is retaining a cohesionless soil throughout having γ=17 kN/m^3, and φ=35°. Use fixed earth support method to determine: (i) the theoretical depth of penetration, (ii) the anchor force, and (iii) the maximum bending moment in the sheet pile. (13)

(b) Explain with neat sketches, the various types of anchors used in sheet pile walls. (7)

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

First Semester **M.Tech.(CSE)**

Supplementary Examination **February-2019**

CO- 501 Advanced Database Management System

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

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

Q1 a) What is an equivalence rule? Describe various equivalence rules used for query optimization. [10]

b) Explain the B+ tree file organization. What are the steps involved in searching a node in B+ tree? Explain with the help of suitable example. [10]

Q2 a) Define Assertion. How it is different from Trigger? How referential integrity is managed using triggers? [10]

b) Name various algorithms for concurrency control in real time databases. Explain any one of them. [10]

Q3 a) What form of parallelism (inter query, interoperation or intraperation) is likely to be the most important for each of the following task? [10]

i) Increasing the throughput of a system with many small queries.

ii) Increasing the throughput of a system with a few large queries, when the number of disks and processors is large.

b) Draw an ER diagram for HOSPITAL using entities such as patient, doctor, room, receptionist, medicine, employee etc. Clearly state the attributes, relationships, and any assumptions made. [10]

Q4 a) What is the difference between persistent and transient objects? How is persistence handled in typical object-oriented data base systems? [10]

b) Explain Parallel External Sort Merge. How it works? [10]

Q5. a) Let r and s be relations with no indices and assume that the relations are not sorted. Assume infinite memory, what is the lowest-cost way (in terms of I/O operations) to compute $r \bowtie s$? What is the amount of memory required for this algorithm? [10]

b) What do you mean by fragment of a relation? Explain various types of fragmentation with the help of suitable examples. What are the criteria for accessing the correctness of fragmentation? [10]

Q6.a) Compare RDBMS, OODBMS and ORDBMS. [6]

b) Explain in brief Parallel database architecture. [4]

c) Show how to derive the following equivalence by a sequence of transformations using the equivalence rules.

i) $\sigma_{\Theta 1 \wedge \Theta 2 \wedge \Theta 3}(E) = \sigma_{\Theta 1}(\sigma_{\Theta 2}(\sigma_{\Theta 3}(E)))$

ii) $\sigma_{\Theta 1 \wedge \Theta 2}(E_1 \bowtie_{\Theta 3} E_2) = \sigma_{\Theta 1}(E_1 \bowtie_{\Theta 3} (\sigma_{\Theta 2}(E_2)))$. where $\Theta 2$ involves only attributes from E_2. [10]

Q7. Write short notes on any four of the following: [5*4]

i. OLAP
ii. NOSQL
iii. Database Recovery
iv. Knowledge Base System
v. Multimedia Database

Total No. of Pages :1

Ist SEMESTER

SUPPLIMENTARY EXAMINATION (February- 2019)

Roll No.....

M.TECH. [CSE]

CO-502 Subject: Parallel Computer Architecture

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

Note: Attempt any five questions. All questions carry equal marks.

1.(a) Explain Flynn's classification of computer system architecture with neat diagram and suitable examples.

(b) Differentiate between SIMD and MIMD super computers with suitable examples

2. .(a) Explain the various network properties and differentiate between static and dynamic inter connection. And also discuss 16X16 baseline network.

(b) What is cache coherence problem? Discuss various protocol to solve the cache coherence problem.

3.(a) Describe the branch effect and branch prediction in detail. And also define the performance degradation factor due to branch prediction.

(b) Explain pipelining by calculating the speedup that may be achieved through pipeline versus base scalar machine. Using a diagram show that how deliberate delay insertion in apipeline could improve the throughput of the machine.

4.(a) Describe efficiency and quality of parallelism with suitable example.

(b) Discuss Amdahl's law and Gustafson's law in detail.

5.(a) Compare the PRAM model with physical model of parallel computers in which PRAM variant can be best model SIMD machines and how?

(b) Describe Tomasulo's and scoreboarding techniques for dynamic scheduling in details.

6.(a) For given pipeline reservation table:

	T1	T2	T3	T4	T5	T6	T7
S1	X					X	
S2			X				X
S3	—	X	—	X	—	—	—
S4			X		X		

(i). Determine the latencies in the forbidden set and the initial collision vector.
(ii). Draw the state transition diagram for scheduling the pipeline.
(iii) Draw the MAL.
(iv) Draw the speedup and efficiency of the pipeline.

(b) Draw and define the architecture and instruction format of a VLIW processor.

7. Write short notes on the following :
i. Perfect shuffle and exchange.
ii. C/S Access memory organization.
iii. Software parallelism Vs hardware parallelism
iv. Grain packing and scheduling.

-283-

Total No. of Pages :1

Roll No.....

Ist SEMESTER

M.TECH. [CSE]

SUPPLIMENTARY EXAMINATION

(February- 2019)

CO-551 Subject: Distributed System

Time: 3:00 Hours

Max. Marks: 100

Note: Attempt any five questions. All questions carry equal marks.

1.(a) What is Distributed Computing System? Describe its different models.

(b) What are different types of distributed file architectures? Give example.

2.(a)Explain the advantage of three phase commit.

(b) What are client centric models?

3.(a) Describe the RPC in detail.

(b) What are Kerberos authentication?

4.(a) What are virtual synchrony and how it does relate to atomic multicast.

(b) What is scalable Reliable multicasting?

5. (a) Explain mechanisms of access control.

(b) Briefly describe clock synchronization.

6.(a) Briefly describe the mutual exclusion and Election Algorithm.

(b) What are different failure models.

7. Write short notes on any four:

i. NFS(Network file system)
ii. Superpeers
iii. Logical clocks
iv. Digital signature.

Total No. of Pages: 02 Roll No_____

FIRST SEMESTER **M.Tech. (ISY)**

END SEMESTER EXAMINATION **FEBRUARY-2019**

Supplementary Examination

IT-552 DIGITAL IMAGE PROCESSING & ANALYSIS

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

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

1284

Question No. 1 **[10x2=20]**

Consider an image of size 512×512. If this image is transmitted to a channel of 20Mbps. Determine the transmission time required to transmit the following images:

[a] The original image is converted into a grayscale image of size half of the original image.

[b] Grayscale image is converted into a binary image of size half of the grayscale image.

Question No. 2 **[10x2=20]**

[a] Consider an image $f(m,n)$ and sample template$[X\ Y]$. Image $f(m,n)$ is as defined:

$$f(m,n) = \begin{bmatrix} 1 & 1 & 2 & 2 \\ 1 & 1 & 3 & 3 \\ 1 & 1 & 3 & 3 \\ 2 & 2 & 2 & 1 \end{bmatrix}.$$ Determine the Gray Label Co-occurrence Matrix (GLCM) of an Image $f(m,n)$.

[b] What are unitary transform? Determine the 2D-DFT of the 4×4 gray scale image given below:

$$f[m,n] = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

Question No.3 **[20]**

Explain the Histogram equalization and perform the histogram matching operation on the 8×8 image with the following histogram:

Grey levels (r_k)	0	1	2	3	4	5	6	7
No. of pixels	8	10	10	2	12	16	4	2

The target histogram of the image:

Grey levels (r_k)	0	1	2	3	4	5	6	7
No. of pixels	0	0	0	0	20	20	16	8

Question No.4 **[10x2=20]**

[a] Compute the median value of the marked pixels in image shown below using a 3×3 Mask:

18	22	33	25	32	24
34	(128)	(24)	172	(26)	23
22	19	32	31	28	26

[b] What are the various steps involved in frequency domain filtering?

Question No.5 **[10x2=20]**

Consider a digital image $f(x,y) = \begin{bmatrix} 1 & 7 & 3 \\ 5 & 2 & 4 \\ 1 & 2 & 3 \end{bmatrix}$, in this image the last bit plane is removed and perform the followings:

[a] Represent the image after removing the plane.

[b] Compare the original histogram of image with histogram of removed plane image.

Question No.6 **[10x2=20]**

Write the short notes on any **TWO** *of the followings:*

[a] Image formation model

[b] Contrast stretching

[c] Image restoration model

[d] Dilation & Erosion

Total no. Of Pages 3

Roll No.....

FIRST SEMESTER

M.Tech(C&I/PS)

SUPPLEMENTARY EXAMINATION

February-2019

EE-502/512 **Integrated Electronics and Applied Instrumentation**

Time: 3 Hours

Max. Marks 100

NOTE: Attempt any 10 questions. All questions carry equal marks.

Q1 Realize the given Boolean expression using CMOS logic gates.

F = (A+B)'C

Q2 Find the transfer function (V_o/V_{In}) for the circuit given in figure1

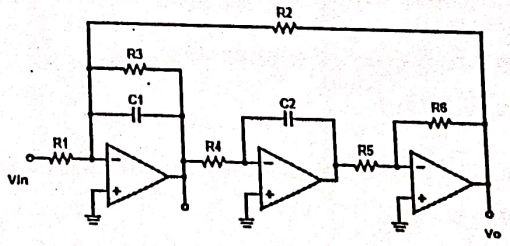


Figure 1

Q3 Find the V_O in terms of V_{In1} and V_{In2} for the circuit given in figure2

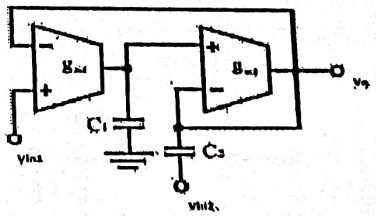


Figure2

1285-1

Q4 Explain the internal circuit of 555 timer and show how 555 timer can be used for frequency modulation.

Q5 Draw and explain the internal structure of operational transconductance amplifier.

Q6 Draw the circuit of a BJT differential amplifier and derive the expression of its CMRR.

Q7 Realize a grounded inductor using Op-amp and show the derivations.

Q8 [a] Explain the following terms in respect of Logic Families [6]

I. Fan-out
II. Noise Margin
III. Propagation Delay

[b] Draw and explain the working of a TTL NAND gate [4]

Q9 Explain the functioning of a phase lock loop and describe in detail the structure of IC565.

Q10 [a] Draw and analyse the circuit of a current to voltage converter using op-amp. [5]

[b] Draw and explain a peak detector circuit using op-amp. [5]

Q11 Find the transfer function (V_o/V_i) for the circuit given in figure3. Is any filter realized with this. If yes find its cut-off frequency and quality factor.

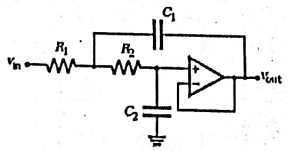


Figure 3

Q12 Write short notes on any two of the following : 5X2=10

[a] Monostable multivibrator using IC741

[b] Grounded inductor realization using OTA

[c] Wein Bridge oscillator

END

-2867

Total No. of Pages 2 —287— Roll No. .....

M.Tech (C&I) FIRST SEMESTER

SUPPLEMENTARY EXAMINATION (Feb.-2019)

EE-513 PROCESS INSTRUMENTATION & CONTROL

Time: 3:00 Hours *Maximum Marks : 100*

Note : Question No. *ONE* is compulsory.
Answer any *FOUR* questions from the remaining.
Assume suitable missing data, if any.

1 Answer in brief.

[a] The model equation of a liquid level system is given by

$$\frac{dV}{dt} = q_1 - q_2$$

Where V is the volume of liquid in the tank and q1 and q2 are inflow and out flow rate respectively. Draw a feed forward control strategy PI diagram as well as block diagram to control level in the tank.

[b] Write transfer function of a first order process with delay. How do you determine the time constant and gain?

[c] In developing dynamic model of the processes either integral balance or instantaneous balance methods are adopted. Name the processes in which these methods are used to develop the process model.

[d] In gas surge drum, if v is the volume of the drum n = total amount of gas moles contained in the drum, qi and q are the inlet and outlet molar flow rate then write the relationship for the pressure in the drum, p and molar flow rates. Is it an integrating process?

[e] In a Jaketed Stirred Tank heater, identify the input and output variables.

[f] Differentiate between Indirect and direct ratio control methods?

[g] What are three common type of energy in thermal process? Write equation for total energy.

[h] Draw a schematic diagram of a stirred-tank heater (STH) and find the process gain kp and time constant tp, Assume the STH has following parameters. Volume Vs= 50 liters; Flow rate Fs= 10 liters/min. cp=1 kcal/liter •C.

[i] What is split range control in processes?

[j] State and describe control algorithm of an on-off controller for level control in a tank. Assume h the measured level, hsp desired height and Δh is the width of the band over which the level is to be maintained. Draw the necessary PI diagram also.

2×10

2 The transfer function of a process and measurement element is given by. **20**

$$g(s) = \frac{e^{-0.4s}}{(2s+1)(2s+1)}$$

(i) Specify the gain of the proportional controller to be used in this control.

(ii) Sketch Bode plot of the g(s).

3 Describe with help of neat Process instrumentation and block diagrams the feedback and feed forward control strategy for temperature control, where a fired furnace is used to heat a process stream.The outlet temperature is controlled by manipulating the valve position of the fuel gas control valve and feed forward controller measure the disturbance in the process fluid flow rate and adjust the manipulated input.

20

P.T.O

4[a] The first order process is defined as

$$G(s)=\frac{k}{Ts+1}$$

Determine the offset due to step set point change in process with P controller having gain Kc. **10**

[b] Draw a schematic and also a block diagram for a pneumatic PI controller and explain its operation to control the pressure. Derive transfer function of the controller pc(s)/e(s). State the condition of valve resistance and stiffness of the bellows under which PI controller acts as an on- off controller. **10**

5[a] Two interacting liquid level control (first order process) are operating in series with equal time constant. Derive the overall transfer function qo/qi of the process. Determine and sketch the time response of level change for unit step chance in inlet flow rate. **10**

[b] A conveyor belt is run by switching on/off a motor. An optical detector is placed to detect the bottle on the conveyer. Upon detecting a bottle on the conveyor belt for 1.5 sec., the conveyor belt is stopped for 2 sec. to fill the bottle with juice. Use momentarily pressed start button and NC stop button. A light should be on when the system starts. When 100 bottles of juice are filled , the conveyor belt stops moving and light also goes off. Draw the PLC ladder diagram to implement this control scheme **10**

6 What is the ratio control? Which type of processes use ratio control? Draw a block diagram of indirect and direct approach for implementing ratio control and determine the process gain. **20**

7 What is the fundamental characteristic structure of cascade control? Draw a neat block diagram for cascade control scheme in a fired furnace and derive the closed-loop transfer function relating the primary set point to the primary process output for a cascade-control system. Also discuss the purpose of the secondary loop in a cascade control structure. Discuss the tuning procedure for a cascade control system. **20**

Total No. of Pages 02 Roll No. .....

FIRST SEMESTER M.Tech. (C&I)

SUPPLEM. EXAMINATION FEB 2019

EE-561 MODELLING, IDENTIFICATION AND CONTROL

Time: 3:00 Hours Max. Marks: 100

Note : Question no. 1 is compulsory. Answer any four questions from remaining. Assume suitable missing data if any.

1. Write true or false and justify your answer. (2X10)
   (a) Low value of proportional band is desirable in proportional controller.
   (b) The desired output behaviour is specified in form of a trajectory in model-based optimization approach of control system design.
   (c) Appropriate performance criterion is not required for selection of controller.
   (d) For flow control, proportional controller is the best choice.
   (e) Least squares estimate and recursive least squares estimate are related.
   (f) The classical feedback controller design approach is better than the direct synthesis approach for controller design.
   (g) The equations for system parameters are always such that all parameters can be identified.
   (h) Deadbeat controller provides better response than Dehlin's control algorithm.
   (i) Sampling period should always be in the range 0.7 to 0.9 of the dominant time constant or dead time, whichever is larger.
   (j) Tuning methodologies for digital controllers are two and they are different than continuous controllers.
2. (a) Explain the various control actions and their effects on process. What are various controllers ? (10)
   (b) For the overdetermined equations:

$$4x_1 - x_2 = -4$$
$$3x_1 + x_2 = 1$$
$$x_1 - 2x_2 = -5$$
$$2x_1 + 2x_2 = 1$$

   Determine the Least Square Estimate of vector x.

3. (a) Derive/develop the algorithm for Recursive Least Squares Estimate and draw its block diagram also. (10)

(b)Consider the estimation of a two vectors x_1 and x_2 from the following measurements:

$$z_1 = 2 = 2x_1$$
$$z_2 = 5 = x_1 - x_2$$
$$z_3 = 4 = 3x_1 + x_2$$
$$z_4 = -4 = x_1 + 2x_2$$

Find the recursive least squares solution. (10)

4. (a) Explain the system identification with the help of some suitable example. (10)

(b) Design a controller for the following second –order system:

$$g(s) = \frac{1}{(2s+1)(3s+1)}$$

Using the direct synthesis approach, given that the desired closed loop behaviour is first order system with $\tau_r = 4$. Also compare the controller with that resulting from choosing $\tau_r = 1$.

5. (a) Prove that, for synthesis of Time Delay Systems, second order trajectory can not be selected. (10)

(b) Design a controller for the following inverse response system:

$$g(s) = \frac{(1-4s)}{(3s+1)(5s+1)}$$

Using the direct synthesis approach taking a suitable reference trajectory.

6. (a) Test time the following digital controller pulse transfer functions for physical realizability: (10)

(i) $D(z) = \frac{4z^{-1}+3+3z^{-2}}{1+4z^{-1}}$

(ii) $D(z) = \frac{3+2z+3z^{-2}}{1+4z^{-1}}$

(iii) $D(z) = \frac{3+z+2z^{-1}+3z^{-2}}{1+4z^{-1}}$

(b) Derive the discrete time model of a PID controller. (10)

7. (a) Explain position form & velocity form of control algorithms. Which one is advantageous and why ? (10)

(b) Write short notes on any two of the following: (2x5)

(i) Stochastic process

(ii) Random process & random variables

(iii) Correlation

Total No. of Pages 02

Roll No. .....

FIRST SEMESTER

M.Tech.[C&I]

Supp. EXAMINATION Feb *2019*

EE-562 Discrete Data System & Digital Control

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

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

Q1 [a] Obtain the state space (State Model) representation for the armature controlled DC motor. (10)

1[b] A system is described by the following differential equation. Represent the system in phase variable form: (10)

$$\frac{d^3x(t)}{dt^3} + 3\frac{d^2x(t)}{dt^2} + 4\frac{dx(t)}{dt} + 4x(t) = u_1(t) + 4u_2(t) + 6u_3(t)$$

Outputs are

$$y_1(t) = 4\frac{dx(t)}{dt} \div 3u_1(t)$$

$$y_2(t) = \frac{d^2x(t)}{dt^2} + 4u_2(t) + u_3(t)$$

Q.2 [a] Solve the difference equation (10)

$$c(k+2) + 3c(k+1) + 2c(k) = u(k);\ c(0) = 1$$
$$c(k) = 0\ for\ k < 0.$$

2 [b] Determine the inverse Z-transform f(k) for the function (10)

$$F(z) = \frac{-10(11z^2 - 15z + 6)}{z^3 - 4z^2 + 5z - 2};\ for\ all\ k \geq 0.$$

Q.3 [a] Find c(k) for the sampled data control system shown in figure 1. (10)

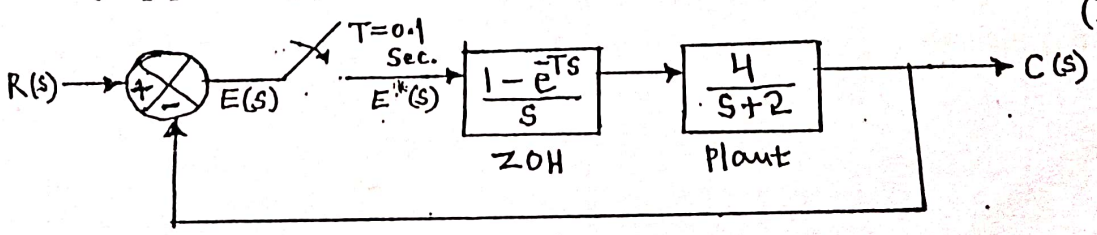


Fig. 1

3 [b] For a system represented by the state equation (10)
$\dot{X}(t)=AX(t)$

the response of

$X(t)=\begin{bmatrix} e^{-2t} \\ -2e^{-2t} \end{bmatrix}$ when $X(0)=\begin{bmatrix} 1 \\ -2 \end{bmatrix}$

And

$X(t)=\begin{bmatrix} e^{-t} \\ -e^{-t} \end{bmatrix}$ when $X(0)=\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

Determine the system matrix A and state transition matrix.

Q.4 [a] Discuss the need of sampler and zero order hold devices. Also discuss the sampled data control system with the help of neat diagrams. (10)

4[b]. Determine the stability of the following characteristic equation using Bilinear Transformation. (10)

$Z^3-0.2Z^2-0.25Z+0.05=0$

Q.5 Consider the dynamics of a non-homogeneous system as

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

where u(t) is the unit step function occurring at t =0.

$$y(t) = [1\ 0]X(t)$$

And the initial condition $X(0) = [1\ 0]^T$ (5+10+5)

(a) Determine the STM using the Laplace inverse transform technique.
(b) Determine the solution of state equation
(c) Find the output y(t) at t = 1 sec.

Q.6 A discrete time system is described by state equation (5×4)

$$y(k+2) + 5y(k+1) + 6y(k) = u(k)$$
$$y(0) = y(1) = 0; T = 1\ sec.$$

(a) Determine the state model in canonical form
(b) Find state transition matrix
(c) Determine the state model in phase variable form
(d) For input u(k)=1 for k≥0, find output y(k).

Q.7 Discuss and derive the relationship between the following planes
(a) r plane and s plane
(b) z plane and s plane
(c) s plane and z plane

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

M.Tech III SEMESTER(C&I)FT

SUPPLEMENTARY EXAMINATION (Feb.-2019)

EE-7122 ADVANCED CONTROL SYSTEM DESIGN

Time: 3:00Hours *Maximum Marks : 100*

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

1[a] Prove that if system is completely state controllable then there exit a matrix k that will place the closed loop poles at the desired location. **10**

[b] Prove that in dead beat control, any non zero error vector will be driven to origin in at most n sampling period if magnitude of scalar control u(k) is unbounded. **10**

2[a] Discuss a more general approach to determine the observer feedback gain matrix K. **10**

[b] Consider the system defind by

$$x(k+1)=\begin{vmatrix} 0 & 1 \\ -0.16 & -1 \end{vmatrix} x(k)+\begin{vmatrix} 0 \\ 0 \end{vmatrix} u(k)$$

$$y(k)=|1\ 0|\ x(k) \quad \text{and} \quad u(k)= K_0 r(k)-Kx(k)$$

Design a state feedback control system with refrence input such that desired characteristic equation are at $z=0.5 \pm j0.5$ **10**

3[a] Discuss the designing of sliding mode controller for single input plant. **10**

[b] Prove that for sliding in multi-input system, behavior of the system in sliding can be described as $\dot{X} = (I_n - B(SB)^{-1}S)AX$, $SX=0$ **10**

4[a] By considering linear quadratic regulator problem derive expression for Algebraic Riccati Equation. **10**

[b] Consider the following model of dynamical system

$$\dot{X} = \begin{vmatrix} 0 & 1 \\ 2 & -1 \end{vmatrix} X + \begin{vmatrix} 0 \\ 1 \end{vmatrix} U$$ which is to be controlled to minimise the performance index

P.T.O.

$J=\int_0^{\infty}[X_1^2+\frac{1}{2}X_2^2+\frac{1}{4}U^2]dt$

Find (i) the solution to the ARE corresponding to the linear state Feedback optimal controller.

(ii) the optimal control law

(iii) the value of performance index J for the optimal closed loop system. **10**

5 The approximate difference equation representation for a continuous operating system is $x(k+1)=x(k)+u(k)$; $k=0,1$ where $u(0)$ and $u(1)$ are to be selected to minimize the performance measure $J=x^2(2)+2u^2(0)+2u^2(1)$ subjected to constraints

$0.0\leq x(k)\leq 1.5$; $k=0,1,2$

And $-1.0\leq u(k)\leq 1.0$; $k=0,1$

Quantize the state and control input values in to the step of 0.5 Find the optimal control values and the minimum cost for each point on state grid. What is the optimal control sequence if $x(0)=1.5$? **20**

6[a] Find the extremal of the functional

$J(x)=\int_0^{\pi/4}(x_1^2+\dot{x}_2^2+\dot{x}_1\dot{x}_2)dt$

The boundary conditions are

$x_1(0)=0$, $x_1(\frac{\pi}{4})=1$, $x_2(0)=0$, $x_2(\frac{\pi}{4})=-1$ **10**

[b] Explain the method of solving Optimal control problem using Hamiltonian Formulation of Variational Calculus and hence derive the control equation , Co-state equation and state equation. **10**

7[a] Using principle of calculation of variation find the extremal for the following functional

$J(x)=\int_1^{t_1}(2x+\frac{1}{2}\dot{x}^2)dt$, $x(1)=2$, $x(t_1)=2$, $t_1>1$ **10**

[b] Using principle of calculation of variation derive the equation for transversality condition. **10**

8 Write short notes on any two of the following

[a] Designing H_2 controller

[b] Tuning of PID controller **10,10**

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

FIRST SEMESTER M.Tech.[MOCE]

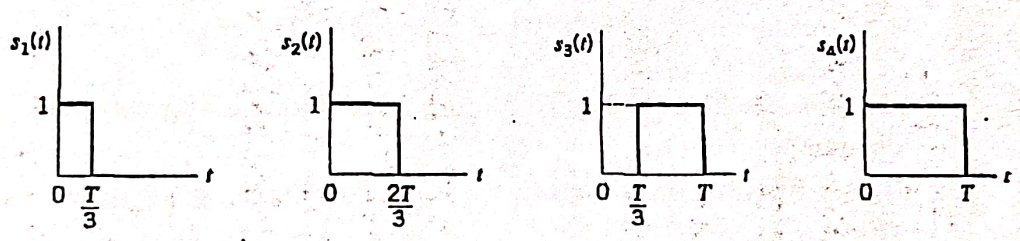
SUPPLEMENTARY EXAMINATION (FEB.-2019)

EC-501 ADVANCED COMMUNICATION SYSTEMS

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

Note: Attempt All Questions.
Assume suitable missing data, if any.

Q1. (a) Describe the Grahm Schmidt orthogonalization procedure and find out the constellation diagram or signal space diagram for the following signals: **[10]**



(b) Define Autocorrelation function of a wide sense stationary (WSS) random process and mention its properties? **[5]**

(c) Attempt any one of the following

1) Consider a sinusoidal signal with random phase defined by **[5]**

$$X(t) = A\cos(2\pi f_c t + \theta)$$

Where A and f_c are constants and θ is a random variable that is uniformly distributed over the interval $[-\pi, \pi]$. Find out mean and autocorrelation of this random process and comment whether it is a WSS process.

2) Define Ergodic processes and find out the expression for enseble mean of the output $Y(t)$ of an LTI system $h(t)$ with a stationary random process $X(t)$ as its input. **[5]**

Q2. (a) Define matched filter and find out the expression of the impulse response $h(t)$ of the matched filter for an input signal $s(t)$ of duration 0 to T secs. **[10]**

(b) Define the following with suitable illustrations: **[5]**

1). Scalar Quantization 2). Vector Quantization

(c) Attempt any one of the following **[5]**

1) Define Rate Distortion theorem.

2) Define Quadrature Amplitude Modulation (QAM). [5]

Q3. a) Explain in detail, the Pulse Code Modulation (PCM) with the help of a block diagram. Find out the output signal-to-quantizing-noise ratio $(SNR)_o$ in a PCM system for a full-scale sinusoidal modulating signal with amplitude A and indicate the increase in $(SNR)_o$ in dB per bit. [10]

b) Encode the following sequence using the Lempel Ziev source coding algorithm [5]

0100001100001010000010100000110000010100001001001

(c) Attempt any one of the following:

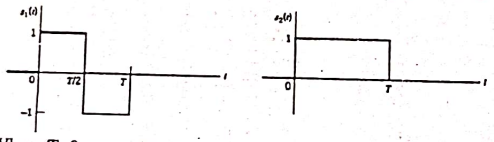
1). Encode the following alphabet consisting symbols (A,B, C, D, E, F, G) with corresponding probabilities (3/8, 3/16, 3/16, 1/8, 1/16, 1/32, 1/32) using Huffman coding algorithm and find out the efficiency of the coding scheme. [5]

2). Define Mutual Information with suitable expressions and show that [5]

$$H(X|Y) = \sum_{y} p(y)H(X|Y=y)$$

Q4. (a). Describe the M-ary Pulse Amplitude Modulation along with its signal space diagram. [5]

(b). Binary information is transmitted using baseband signals of the form shown as [10]



Where T=8 msecs. Design a correlation receiver and find the probability of error if the channel is considered as AWGN channel with noise power spectral density 10^{-3} watt/Hz. Derive all the necessary expressions.

(c) Attempt any one of the following

1). Find out the BER expression for the Coherent Binary Phase Shift Keying (CBPSK) based on the Maximum Aposteriori Probability (MAP) detector along with its signal space diagram depicting the decision boundary. [5]

2). Determine the power spectral density of the Coherent Binary Phase Shift Keying (CBPSK) scheme and draw its power spectra. [5]

Q5. (a). Explain following multiple access techniques with suitable illustrations: [10]

1). Time Division Multiple Access (TDMA)

2). Frequency Division Multiple Access (FDMA)

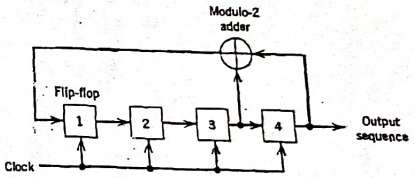
3) Code Division Multiple Access (CDMA)

(b). Explain Direct Sequence Spread Spectrum (DSSS) with coherent binary phase shift keying with the help of block diagram of transmitter and receiver. [5]

(c). Attempt any one of the following

1). Mention the advantages and disadvantages of multipath propagation phenomenon in wireless communication and explain how does it cause various types of fading? [5]

2). Figure below shows a four-stage feedback shift register used to generate a PN sequence. The initial state of the register is 1010. Find the output sequence of the shift register and determine whether it generates a maximal length PN sequence? [5]



****Good Luck****

Total No. of Pages - 297 - Roll No. .....

M.TECH. (VLSI and Embedded Systems)

SUPPLEMENTARY EXAMINATION February, 2019

EC-511: Analogue ICs Design

Time: 3 Hours Max. Marks: 100

Note: Answer any five questions. Any missing data may be reasonably assumed. Symbols have their usual meanings.

Q.1 (a) If the drain, gate, source and bulk voltages of the NMOS transistor are 3V, 2V, 0V and 0V, respectively, W/L ratio of 5μm/1 μm, channel length modulation parameter $\lambda = 0.04V^{-1}$, transconductance parameter 110 $\mu A/V^2$ and threshold voltage 0.7V, calculate:

(i) Region of operation of the transistor

(ii) Drain current

4+4

(b) For the identical MOSFETs (Fig. 1), determine the input resistance $R_{in} = \frac{v_{in}}{i_{in}}$. 6

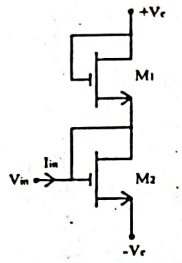


Fig. 1

(c) Sketch a neat high frequency MOSFET model and hence derive an expression for the unity gain frequency (f_T). 6

Q.2 (a) For the circuit shown in Fig.2, deduce an expression for the differential output current (I_{01}- I_{02}) as a function of V_1 and V_2. Assume identical devices with triode region operation. 10

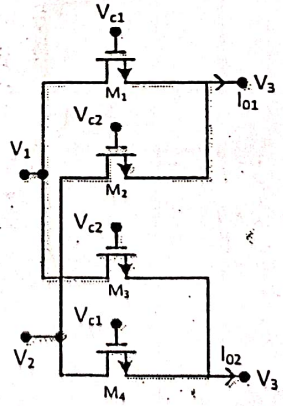


Fig.2

(b) Draw a neat circuit diagram of NMOS output stage and hence deduce the expressions for its output voltage and output resistance. 10

Q.3 (a) For the circuit shown in Fig.3, determine the relationship between I_0 and I_{in} in terms of K_1, K_2, K_3 and K_4 of all four MOSFETs; $K_i = \mu_s C_{ox}(\frac{W}{2L})(i = 1-4)$. Assuming $|V_{th1}| = |V_{th2}| = |V_{th3}| = |V_{th4}|$. **10**

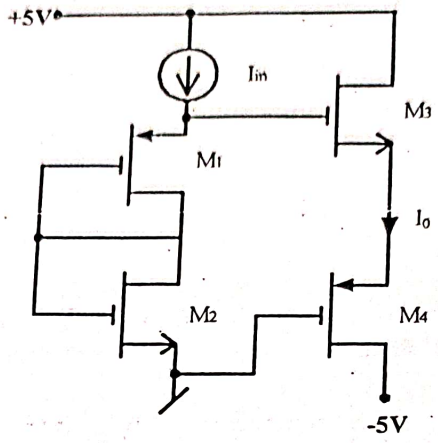


Fig. 3

Q.3 (b) For the circuit as shown in Fig. 4, calculate the voltage gain and the output resistance. **10**

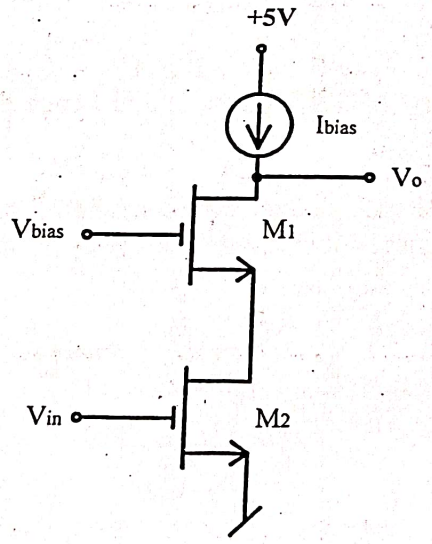


Fig. 4

Q.4 (a) Show that the circuit of Fig. 5 realizes a linear voltage-controlled grounded resistor. M_1, M_2 and M_3 are matched MOSFETs. State the assumptions made. **10**

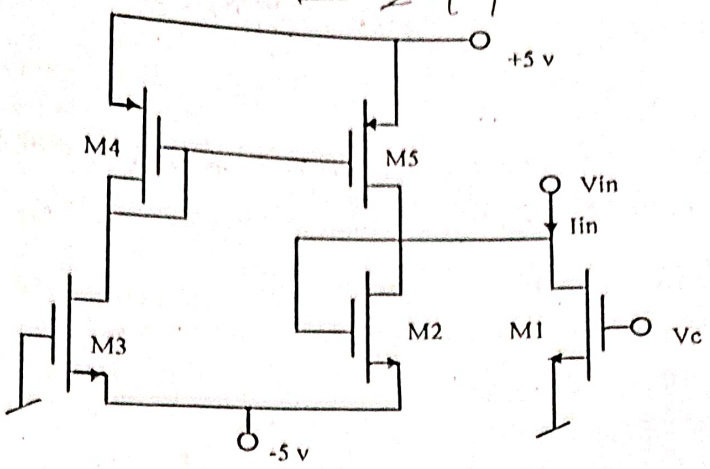


Fig. 5

Q.4 (b) For the two-stage CMOS op-amp shown in Fig. 6, determine the voltage gain $A_{v1} = \frac{v_{o1}}{v_{in}}$. **10**

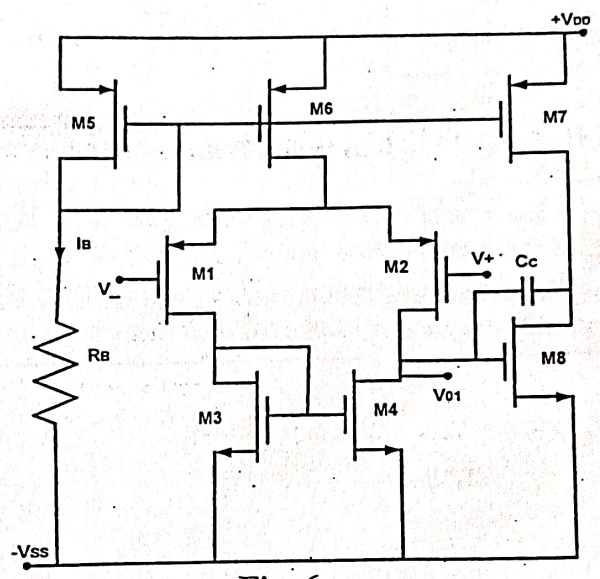


Fig. 6

Q.5 (a) (i) Show that the phase angle difference 'ϕ' between input and VCO-output (when PLL is locked) is given by $\phi = \frac{\pi}{2} + \frac{f_s - f_0}{K_v K_\phi A}$; where symbols have their usual meanings. **6**

(b) Describe how PLL can be used for (i) AM detector and (ii) FSK demodulator **4+4**

(c) Write a short technical note on CMOS OTA **6**

Q.6 For a simple CMOS op-amp shown in Fig.7, the W/L ratios indicated in Table 1. The op-amp powered by supply voltages Vdd = 5V, Vss =-5V. Calculate I_B, I_C, V_c, V_B and V_{D2} for I_0 =20 μA, $V_{thn} = |V_{thp}| = 1V$, $\mu_n C_{ox} = 20\ \mu A/V^2$, $\mu_p C_{ox} = 10\ \mu A/V^2$.

Table 1

	MA	MB	MC	M1	M2	M3	M4	M5
W(μm)	10	20	10	20	20	5	5	90
L(μm)	10	100	10	5	5	11	11	20

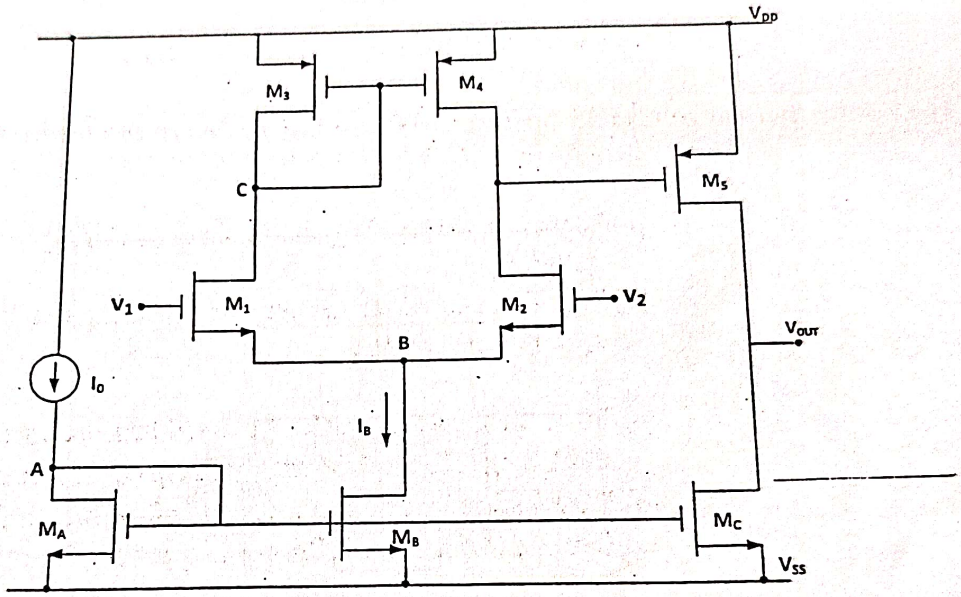


Fig. 7

-------END-------

-301-

Total No. of Pages: 01
M.Tech. (VLSI)
Supplementary Examination

Roll No.....
First Semester
Feb-2019

EC-512: IC TECHNOLOGY

Time: 03 hours

Max. Marks: 100

Note: All Questions are compulsory.
Assume suitable missing data, if any.

1. [a] Differentiate between NTRS and ITRS. [10]
   [b] Differentiate between grown junction transistor technology and alloy junction transistor technology. [10]

2. [a] Explain the steps involved in active region formation in a CMOS circuit. [10]
   [b] Differentiate between LOCOS and STI. [10]

3. [a] Explain tip and LDD formation steps in a CMOS circuit. [10]
   [b] Explain multilevel formation procedure in a CMOS circuit. [10]

4. [a] What is gettering? Explain in detail extrinsic gettering and intrinsic gettering. [10]
   [b] Explain in detail the structure and working of a HEPA filter, with appropriate diagrams. [10]

5. [a] What are the steps involved in local interconnect formation in a CMOS circuit. Explain with the help of diagrams. [10]
   [b] Why wafer cleaning is necessary before silicon device fabrication? Explain in detail the RCA clean approach for wafer cleaning. [10]

-END-

Total No. of Pages-2 Roll No.....

FIRST SEMESTER M.TECH.(VLSI Design & Embedded System)

SUPPLEMENTARY EXAMINATION

(FEB - 2018)

EC-513 VLSI DESIGN

Time: 3 Hours Max. Marks: 100

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

1. (a) For the inverter shown in Fig. 1 (i) Assuming that V_{IN} swings from rail-to-rail (0 to 2.5V), compute the values of V_{OH}, V_{OL}, V_M. ($|2\phi_F| = 0.6$ V and $\gamma = 0.4\ V^{0.5}$, $V_{T0} = 0.43$V, $k_n' = 75\ \mu A/V^2$. 12

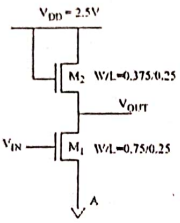


Fig.1

(b) Determine the low-to-high propagation delay using average current method. Assume that the input switches from 2.5V to 0V with a zero-fall time. 8

2. (a) Consider the circuit of Fig. 2. Assume the inverter switched ideally at $V_{DD}/2$, neglect body effect, channel length modulation and all parasitic capacitances throughout this problem. (i) What is logic function performed by the circuit? (ii) Explain why this circuit has non zero static dissipation. (iii) Using just one transistor design a fix, so that there will not be any static power consumption. Explain how you chose size of transistor? (iv) Implement the same circuit using transmission gates. 12

(b) What is logic function implemented by circuits of Fig. 3? Do these two circuits have same output resistance when driven by same input pattern? Size transistors using equivalent inverter model if $W/L)_n = 1$ and $W/L)_p = 2$ for inverter. 8

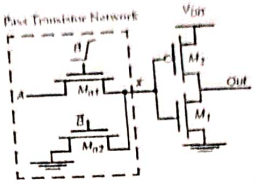


Fig. 2

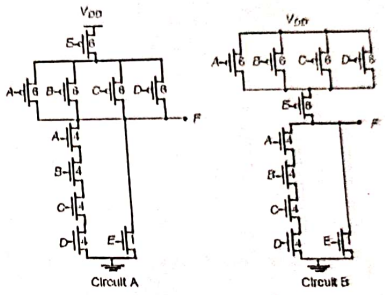


Fig. 3

3. (a) What are lambda-based layout design rules? Draw layout of a CMOS inverter using lambda-based design rules. Clearly specify the dimensions. 12

(b) How does full and constant voltage scaling affect substrate doping, threshold voltage, drain current and power dissipation of the device. 8

4. (a) Design negative edge triggered D flip flop using inverters and transmission gates. Add logic to facilitate clear and preset operation? 12

(b) Draw schematic of TSPC D latch and explain its working briefly. 8

5. (a) Consider the conventional N-P CMOS circuit of Fig. 4. For this entire problem, assume that the pull dowown/pullup network is simply a single NMOS/PMOS device, so that each Domino stage consists of a dynamic inverter followed by a static inverter. Assume that the precharge time, evaluate time, and propagation delay of the static inverter are all $T/2$. Assume that the transitions are ideal (zero rise/fall times) (i) Do any problems occur when the input makes a 0->1 transition? What about a 1->0 transition? If so, describe

what happens and insert one inverter somewhere in the circuit to fix the problem (ii) For your corrected circuit, complete the timing diagram for signals Out_1, Out_2, Out_3 and Out_4, when the *IN* signal goes high before the rising edge of the clock φ. Assume that the clock period is 10 T time units. **12**

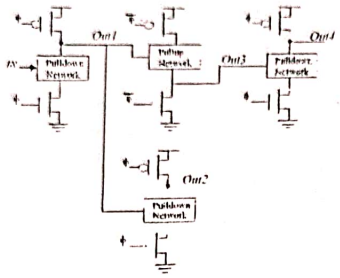


Fig. 4

(b) For the circuit of Fig. 5, what are the logic functions obtained at F and G? **8**

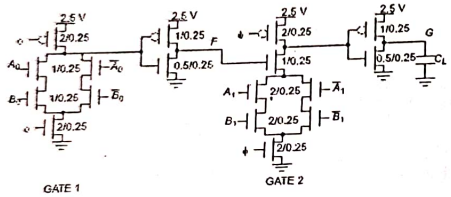


Fig. 5

4x5

6. Attempt any four from the following
   (a) MOS Capacitance types and their variation with bias conditions.
   (b) Delay of two input CMOS NAND gate using Elmore delay model.
   (c) 6T XOR Cell design.
   (d) Multiple output domino logic
   (e) Channel length modulation, drain induced barrier lowering, hot carrier injection, threshold voltage for narrow width device.
   (f) Describe concept of hierarchy, modularity and regularity with suitable examples
   (g) Transmission gate based realization of 4:1 MUX

Total No. of pages:3 *Roll No.....*

I[st] SEMESTER **M.Tech (SPDD-ECE)**

Supplementary Examination **Feb 2019**

EC-521 Advanced DSP

Time : 3Hrs **Maximum Marks: 100**

Note: Attempt any 10 questions. Assume missing data if any.

1	a	The output signal of upsampler system is to be passed through Low Pass Filters. Is the statement true ? If true, why?	4
	b	Consider the sequences i $x_1(n) = 3\delta(n+1) - 2\delta(n) + \delta(n-1) + 4\,\delta(n-2)$ ii $x_2(n) = \delta(n+2) - \delta(n) + \delta(n-2)$ iii $h_1(n) = 2\delta(n-1) + 5\delta(n-2) + 3\delta(n-3)$ iv $h_2(n) = \delta(n) + \delta(n-1)$ Determine the following sequences obtained by linear convolution of a pair of the above sequences $y_1(n) = x_1(n) \circledast h_1(n)$ $y_2(n) = x_2(n) \circledast h_2(n)$	6
2	a	The impulse response of a LTI system is h(n) = {1,2,1,-2}. Find response of the system for the input x(n)={1,3,2,1}	5
	b	Find the inverse Fourier Transform of first order recursive filter $H(\omega) = (1-ae^{-j\omega})^{-1}$	5
3		Compute the DFT of the 3-point sequence x(n) = {2,1,2}. Using the same sequence compute 6-point DFT and compare two DFTs	10
4	a	Let x(n) = {A,2,3,4,5,6,7,B}. If X(0) = 20 and X(4) = 0 find A and B	5
	b	Consider the length-6 sequence defined for $0 \leq n < 6$. x(n) = {1,-2,3,0,-1,1} with a 8-point DFT X(k). Evaluate the following functions of X(k) without computing DFT i. X(0) ii. X(3) iii. $\sum_{k=0}^{5} X(K)$ iv. $\sum_{k=0}^{5} \lvert X(k)\rvert^2$	5

5 Find the circular convolution of the following sequences using DFT and IDFT 10

$x_1(n) = \{1,2,1,2\}$ and $x_2(n) = \{4,3,2,1\}$

6 Determine the total solution for $n \geq 0$ of the difference equation 5

i. $y[n] + 2\,y[n-1] = (n+1)$
with initial condition $y[-1] = 1$ and $y[-1] = 0$

ii. $y(n) + 0.5\,y(n-1) = 2\,u(n)$ 5
with initial condition $y[-1] = 2$

7 Using properties of Z Transform find the Z-Transform of the following signals 10

i. $x(n) = u(-n)$
ii. $x(n) = u(-n+1)$
iii. $x(n) = u(-n-2)$
iv. $x(n) = 2^n u(n-2)$
v. $x(n) = \alpha^{n-2} u(n-2)$

8 Find inverse Z Transform of

i. $\frac{z^2+2z}{z^3+3z^2+4z+1}$; ROC $|z| > 1$ 10

ii. $\frac{z^2+z+2}{z^3-2z^2+3z+4}$; ROC $|z| < 1$

9 a A non causal LTI FIR discrete Time system is characterized by an impulse response $h(n) = a_1\delta(n-2) + a_2\delta(n-1) + a_3\delta(n) + a_4\delta(n+1) + a_5\delta(n+2)$. For what value of the impulse response samples will its frequency response H $(e^{j\omega})$ have a zero phase 5

b A non causal LTI FIR discrete Time system is characterized by an impulse response $h(n) = a_1\delta(n) + a_2\delta(n-1) + a_3\delta(n-2) + a_4\delta(n-3) + a_5\delta(n-4) + a_6\delta(n-5) + a_7\delta(n-6)$. For what value of the impulse response samples will its frequency response H $(e^{j\omega})$ have a linear phase 5

10 a Show that the 3DB frequency of Low Pass and High pass IIR filter is same. Assume first order LPF and HPF 5

b Show that ideal filters are not realizable. How can we improve the characteristics of a simple LPF near to characteristics of ideal filter 5

11 Determine the fundamental period of following periodic sequences

i. $x_1[n] = e^{-j0.4\pi n}$
ii. $x_2[n] = \sin(0.6\pi n + 0.6\pi)$ 10
iii. $x_3[n] = 2\cos(1.1\pi n - 0.5\pi) + 2\sin(0.7\pi n)$
iv. $x_4[n] = 3\sin(1.3\pi n) - 4\cos(0.3\pi n + 0.45\pi)$
v. $x_5[n] = 5\sin(1.25\pi n + 0.65\pi) + 4\sin(0.8\pi n) - \cos(0.8\pi n)$

12 a Let $x_{ev}[n]$ and $x_{od}[n]$ represent even and odd parts of a square summable sequence $x[n]$. Prove the following result
$\sum_{-\infty}^{\infty} x^2[n] = \sum_{-\infty}^{\infty} xev[n]^2 + \sum_{-\infty}^{\infty} xod[n]^2$

b Compute the energy of length N sequence
$X[n] = Cos\left(\frac{2\pi Kn}{N}\right)$ $0 \leq n \leq N-1$

END

1 - 305

Roll No. .....

Total No. of Pages 2

M.Tech.[SPDD]

FIRST SEMESTER

SUPPLEMENTARY EXAMINATION *(February 2019)*

EC-523 STATISTICAL MATHS AND WAVELET THEORY

Time: 3 Hours *Max. Marks : 100*

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

1 (a) Define orthogonal wavelets. Give examples.
(b) Define biased and unbiased estimators.
(c) Write scaling equation.
(d) Define type I and type II errors for hypothesis testing.
(e) Define vanishing moments of wavelets. What does it represent?

2(a) Sate and prove perfect reconstruction condition of first stage wavelet basis.

2(b) Draw a p^{th}-stage analysis and synthesis phase of wavelet the analysis for both, recursive and nonrecursive stages. Also, find out output expressions of analysis and synthesis phase for both.

3 (a) (i) Find out the windowed Fourier transform of a sinusoidal wave $f(t) = \exp(i\xi_0 t)$. Also find out its energy spread interval.

3(b) Let X be normally distributed with mean μ and variance σ^2, where both μ and σ^2 are unknown. Use the maximum likelihood method to estimate μ and σ^2.

4(a) Let $N = 2^n$ and $1 \leq p \leq n$, then derive the number of complex multiplications required to compute the output of the p^{th} stage wavelet filter bank.

4(b) Describe the hypothesis test on the mean of a normal distribution, variance unknown.

5 (a) What is nonparametric test? Compare the parametric and non - parametric tests. Describe rank test for homogeneity of Wilcoxon Mann and Whitney.

5 (b) Explain multiple linear regression and derive the matrix form of the least squares normal equations

6 Write short notes on following two:-

(a) Neville Aitken method

(b) Bezier curve

-307-

Total No. of pages

Roll No.

~~SECOND~~ SEMESTER – I

M. Tech.[MOCE]

SUPPLYMENTARY EXAMINATION

~~FEB~~-2019

EC-551 ADVANCE ELECTROMAGNETIC THEORY

Time: 3 Hours

Max. Marks: 100

Answer Any FIVE Questions

Assume suitable missing data, if any

1. Derive the expression of T_{mn}^{z} in a rectangular waveguide of dimension $a\ X\ b$. (20)

2. A partially filled waveguide is shown in Fig.1. Show that for TM to X mode fields $\frac{kx_1}{\epsilon_1} tankx_1 d = -\frac{kx_2}{\epsilon_2} tankx_2(a-d)$ where kx_1 and kx_2 are the wave number in x-direction of region 1 and 2 respectively. (20)

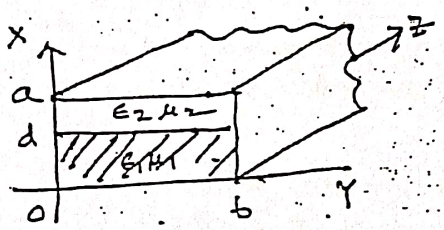


Fig.1.

3. Derive the expression of the quality factor of a circular cavity of radius a and height d. The cavity has been excited with TE_{mnp} mode. (20)

4. For a capacitive rectangular waveguide junction, show that the Z directed power flow at z=0 is given by $P = \sum_{m=1}^{\infty}\sum_{n=0}^{\infty} y_{mn}^{*}|E_{mn}|^2 \frac{ab}{\varepsilon_n}$ (20)

5. Show that the resonant frequencies of the two dimensional (no x variation) resonator formed by conducting plates over x=0, x=a, y=0, y=b planes are the cut-off frequencies of the rectangular waveguides (20)

6. For a circular waveguide of radius a, show that the cut-off frequencies of TMz and TEz modes can be found out from $J_\rho' = 0\ for\ TE_z\ mode$

$$J(K_\rho a) = 0\ for\ TM_z\ mode$$ (20)

(20)

7. Show that

(i) $(Z_0)_{mn}^{TM_x} = \frac{K^2-(m\pi/a)^2}{\omega\varepsilon k_x}$

$= \frac{K^2-(m\pi/a)^2}{\omega\varepsilon\beta}$ $f > f_0$

$== \frac{K^2-(m\pi/a)^2}{-j\omega\varepsilon\alpha}$ $f < f_0$

(ii) $(Z_0)_{mn}^{TE_x} = \frac{\omega\mu k_z}{K^2-(m\pi/a)^2}$

$= \frac{\omega\mu\beta}{K^2-(m\pi/a)^2}$ $f > f_c$

$= \frac{-j\omega\mu\alpha}{K^2-(m\pi/a)^2}$ $f < f_c$

-308-

Total No. of Pages 02 *Roll No. .....*

FIRST SEMESTER M.Tech.[MOCE]

SUPPLEMENTARY EXAMINATION Feburary 2019

EC-552 Numerical Techniques in Electromagnetism

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

Note: Answer all questions

Assume suitable missing data, if any.

1. (a) Write the Maxwell's equations in differential as well as integral form.

(b) List and draw the common grid patterns used in the finite difference scheme.

(c) Explain the sources of error that are nearly unavoidable in numerical solution of problems.

(d) Find $<u,v>$ if $u = 1$, $v = x^2 - 2y^2$ in the rectangular region $0 < x < 1$, $1 < y$

(e) Express $10 \sin(\omega t - kz)\, a_x + 20 \cos(\omega t - kz)\, a_y$ in phasor form.

(f) Discuss the advantages and disadvantages of finite element method over other modelling techniques.

[6 * 5 = 30]

2. Using the separation of variables technique, obtain the solution to the one dimensional heat equation

$$U_{xx} = U_t, \qquad 0 < x < 1, \quad t > 0$$

subject to the boundary conditions $U(0,t) = 0 = U(1,t)$, $t > 0$ and initial condition $U(x,0) = 100$, $0 < x < 1$.

[10]

3. Solve the Poisson's equation $\nabla^2 V = -e^{-x}$ subject to the boundary conditions $V(0,y,z) = V(a,y,z) = V(x,0,z) = 0$; $V(x,b,z) = V(x,y,0) = V(x,y,c) = 0$ and w a=b=c=π, using the series expansion method.

[10]

P. T.O.

4. Solve a boundary value problem defined by

$$\frac{d^2\phi}{dx^2} = x + 1$$

subject to $\varphi(0) = 0$ and $\varphi(1) = 1$, use the finite difference method to find $\varphi(0.5)$. Use $\Delta = 0.25$ and perform 5 iterations.

[10]

5. Explain the Yee's finite difference algorithm to solve Maxwell's equations.

[10]

6. Consider the wave equation of the form

$u^2 \frac{\partial^2\phi}{\partial x^2} = \frac{\partial^2\phi}{\partial t^2}$, where u is the speed of the wave.

Write the equivalent finite difference formula.

Rewrite the equation by choosing the aspect ratio $r = (u\Delta t/\Delta x)^2$

Further draw its computational molecule.

Use the von Neumann approach to determine its stability condition.

[10]

7. Solve the two dimensional Laplace's equation using finite element method.

[10]

8. A potential field is defined over a triangular three node element by

Node i	V_i (V)	x_i(cm)	y_i(cm)
1	40	4	6
2	-10	2	2
3	20	6	2

Calculate the potential and potential gradient at (4, 4) cm.

[10]

Total No. of Pages-2 Roll No.....

1ST SEMESTER M.Tech. [VLSI]

SUPPLEMENTARY EXAMINATION (February-2019)

EC-561 DIGITAL SYSTEM DESIGN

Time: 03 Hours Max. Marks: 100

Note: Answer all Questions, selecting at least Two from each Question. Assume suitable missing data, if any.

1 a) Implement 2 to 4 decoder using logic gates and write VHDL code for the same circuit using any architecture body. **(10)**

b) Explain various types of delays and their modeling in VHDL with suitable examples and diagrams. **(10)**

c) Explain Identifiers and Data Operators in detail with their significance. **(10)**

2 a) Implement the synchronous sequential circuit for state diagram as shown in Fig.1, using D-Flip Flop. **(10)**

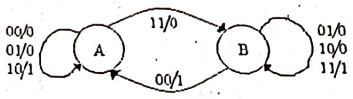


Fig. 1

b) Reduce the given state table using partitioning technique and find a minimum length that distinguishes state q_1 from state q_2. **(10)**

PS	NS, Z	
	X=0	X=1
q_1	q_2, 1	q_8, 1
q_2	q_6, 1	q_4, 1
q_3	q_4, 0	q_5, 1
q_4	q_3, 0	q_6, 1
q_5	q_4, 1	q_3, 1
q_6	q_3, 1	q_3, 1
q_7	q_3, 1	q_4, 1
q_8	q_3, 0	q_1, 1

c) Explain various hazards and faults in digital circuits. Also suggest few examples with methods to make circuits hazard free. **(10)**

3 a) What are the Moore and Mealy machines? Compare them. Define: Successor, terminal state, strongly connected machine and machine equivalence. **(10)**

b) What is a sequential machine? Discuss various memory elements used in sequential machines. How is the state of the memory element specified? **(10)**

c) Construct the compatibility graph and obtain the minimal cover table for the sequential machine described by the state table as given below: **(10)**

PS	NS, Z	
	X=0	X=1
a	-	f, 0
b	b, 0	c, 0
c	e, 0	a, 0
d	b, 0	d, 0
e	f, 1	d, 0
f	a, 0	-

4 a) Design a synchronous sequential circuit (sequence detector) using D flip-flop, which produces an output z=1, whenever input sequence 1011 occurs. Overlapping is allowed. **(10)**

b) Discuss the conversion process for Mealy to Moore machine. Convert the given Mealy state table to Moore State table: **(10)**

PS	NS, Z	
	X=0	X=1
A	A, 0	B, 0
B	C, 0	B, 0
C	A, 0	D, 0
D	C, 1	B, 0

c) List various programmable logic devices. Explain full functioning of FPGA with the help of its block diagram. **(10)**

5 a) What are the elements of an ASM chart, explain each. Compare ASM Chart and Conventional flow chart in detail. **(10)**

b) Draw the state diagram and ASM Chart for the sequence detector that can dete 1010 sequence. Overlapping is allowed. **(1**

c) Draw the ASM chart for the given state transitions. Start from the initial state then if xy = 00 go to T2, if xy = 01 go to T3, if xy = 10 go to T1, otherwise to and design it using multiplexer control method.

Total No. of Pages 01 — 311 —

Roll No. ...

FIRST- SEMESTER
SUPPLEMENTARY EXAMINATION

M.Tech (VLSI)
FEB-2019

EC-562 [DIGITAL SIGNAL PROCESSING]

TIME: 03 Hrs **Maximum Marks:100**

Attempt any five questions. Assume suitable missing data if any.

Q. 1(a) How to obtain the DC gain and high frequency gain of a filter from various representation of impulse responses. [10]

(b) Discuss the sources of Gibb phenomenon in digital filters. State it's remedial. [10]

Q.2(a) What is meant by multirate signal processing? How a up sampler and down sampler can be designed. [10]

(b) By using overlap and save method, find out the output of the filter h(n) = [1,3,4], when the input x(n) = [1,2,3,2,3,4,1,2,0,1 2,2]. [10]

Q.3 (a) Find 4-point DFT X(k) for x(n) = [1,1] by using DIT algorithm. Discuss the radix-2 butterfly computation using DIF? [10]

(b) Find x(n) for X(k) = [1, 2, 3, 4] by using direct computation. [10]

Q.4(a) Realize the following second order FIR system using the form-1 and form-2 form structure. y(n)=3x(n)+5x(n-1)-2x(n-2)- 2y(n-1) . [10]

(b) Give the linear phase realization for the filter h(n)=[1,3/4,17/8,3/4,1 . What is the advantage of a linear phase structure? [10]

Q.5 (a) If y(n)=[1,7/10] and x(n)=[1,-7/10,1/10] than find out the impulse response of the filter. Analyse the causality and stability of the filter. [10]

(b) Explain the technique used for obtaining the transfer function of a ideal HP, BP and BS filter from ideal LP filter. [10]

Q.6 (a) design of a IIR filter by using approximation of derivatives. State its limitation and advantage. [10]

(b)Write short notes on
(i) Group delay and phase delay
(ii)Minimum phase and maximum phase filter

END

Total No. of pages:01 Roll No.....

Ist SEMESTER **M.Tech (EC-SPDD)**

SUPPLIMENTARY EXAMINATION **Feb 2019**

EC-572 ADAPTIVE SIGNAL PROCESSING

Time: 3 Hrs **Max. Marks: 100**

Note: Answer all questions. Assume missing data if any

Q.1(a) Discuss about the design of a resonator. Comment on the importance of r(z-plane). 10

(b) Given a three stage lattice filter with coefficients k1= ¼, k2= ¼ ,K3=1/3 ,

Determine the FIR coefficients for the direct form structure. 10

Q.2(a) Design a notch filter that rejects a specific frequency. Show the b/w of the notch and comment on the phase characteristics of the filter. 10

2(b) Explain comb filter. Discuss with design examples the techniques to improve the quality of notching. 10

Q.3(a) Explain levinson durbin technique.

Or

Compare levinson durbin algorithm with schur algorithm. 10

3(b) Discuss in brief about extended kalman filter. 10

Q.4(a) Explain in brief about Linear predictive coding. 8

4(b) Adaptive noise cancellation. 5

4(c) Compare LMS with RLS 7

Q.5(a) Explain sampling rate conversion method in digital domain. 9

5(b) Polyphasefilter structure. 3

5(c) Applications of multirate signal processing (any two) 8

-END-

Total No. of Pages: 2

M.Tech. (ECE)- VLSI Design and Embedded Systems **III Sem**

SUPPLEMENTARY EXAMINATION

EC 7123 (Advanced topics in VLSI Design)

February, 2019

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

Note: Assume suitable missing data, if any. All questions carry equal marks.
All the notations and abbreviations have their usual meaning. Attempt any **FIVE** questions.

Q.1 Write the algorithm to implement IEEE compatible floating point adders. Subtract $(1+2^{-22}+2^{-23})$ from 3 using floating point arithmetic. (20)

Q.2 Explain the following terms with the help of examples: (20)
(a) Subnormal Numbers
(b) Throughput rate
(c) Latency
(d) Interleaving
(e) Systolic Arrays

Q.3 (a) Represent 52.21875 in IEEE 754-32 bit floating point format.(5)
(b) Add the following two numbers using carry free addition: (5)
$1\bar{1}01\bar{1}0 + 00\bar{1}1\bar{1}0$
(c) Find the canonical signed digit (CSD) equivalent of following numbers:
(i) 10111011 (ii) 1010111 (1)
(d) Represent the following in IEEE 754- 1985 standard format: (4)
0, ∞, QNaN, SNaN.
(e) Write the differences between analysis and estimation from system level power point of view. (5)

Q.4 (a) What are the challenges being faced by FPGAs for their use in Digital Signal Processing? (10)
(b) Explain with the help of an example how sinΘ can be implemented on FPGA using CORDIC algorithm. (10)

P.T.O.

Q.5 (a) Explain activity parameters and complexity parameters being used for power modelling at RTL level. (10)

(b) Design five tap pipelined direct form FIR filter and determine its sampling rate in terms of propagation delay of adder and multiplier. (10)

Q.6 (a) Draw and explain the generic design flow for low power applications. (10)

(b) What do you understand by a task graph. Explain with the help of an example. (5)

(c) Write differences between parallelism and interleaving. (5)

X X

-315-

Total No. of Pages: 2

Roll No.....

THIRD SEMESTER
SUPPLEMENTARY EXAMINATION

M. Tech (SP&DD)
FEB-2019

EC-7214 New Technologies in Image Processing

TIME: 03 Hrs **Maximum Marks:100**

Note:
1) **Attempt any FIVE questions.**
2) **Assume suitable missing data, if any.**

Q.1

[a] What are the different steps of EMD? What is the most common stopping criterion used for EMD? **(10)**

[b] What are the limitations of EMD and EEMD? Compare EEMD with CEEMD. **(10)**

(3 + 3 + 4 = 10)

Q.2

[a] Explain following terms/parameters:-

i. Opening and closing operators and their use for signal denoising.
ii. Selection of Structuring Element (SE) for ECG baseline denoising.
iii. Energy analysis using Hilbert-Huang Transform (HHT).

[b] What are the applications of Dilation and Erosion operators? For given A and B, calculate (i) Internal Boundary of A (ii) External Boundary of A and (iii) Morphological Gradient of A. **(10)**

$$A = \begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \qquad B = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{vmatrix}$$

Q.3

[a] What are the different signal dependent noise in biomedical signals? Explain in detail to Poisson Noise, Film Grain Noise and Speckle Noise. **(10)**

Write short notes on following :- (5 + 5 = 10)

i. Use of multi-frame averaging for noise minimization
ii. Transformation of signal dependent noise to signal independent noise

Q.4

[a] What are the differences between Discrete Wavelet Transform (DWT) and Stationary Wavelet Transform (SWT)? What are the advantages of SWT based filtering over DWT based filtering for EMG denoising of ECG? **(10)**

[b] What is singular spectrum analysis (SSA) of signal? Explain all steps of SSA and compare it with EMD. **(10)**

Q.5

[a] What are the various prior estimators, applied on wavelet coefficients of an image by capturing the sparseness of the wavelet expansions? Explain EM algorithm based hyper-parameters estimator, used to estimate the parameters of BKF density. **(10)**

[b] Explain the Nonlocal Means (NLM) algorithm and selection of followings parameters of NLM Filter :- **(10)**

i. Patch size (P)
ii. Half-width (M)
iii. Bandwidth (λ)

Q.6 Write short notes on followings :- **(2 x 10 = 20)**

[a] Adaptive Wavelet Wiener Filtering (AWWF) method for ECG denoising

[b] Distance Regularised Level Set (DRLS) model and Adaptive Shape Prior Constrained Coupled Directional Level Set method.

- 317 -

Total No. of Pages:02

Roll No. .....

FIRST SEMESTER **M.Tech. (TH**

SUPPLEMENTARY EXAMINATION ***February 2019***

ME-513 OPTIMIZATION TECHNIQUE

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

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

1. a) Consider the following minimization problem.
Minimize $U = x^2+y^2+z^2$
Subject to constraint:
$3x+2y+z = 10$ & $x+2y+2z = 6$.
Solve this using the Lagrange multiplier method. (10)

b) Explain the solution procedure for two variable unconstrained optimization problems. (10)

2. Find optimal solution of the following transportation problem. (20)

	D_1	D_2	D_3	D_4	Supply
S_1	9	16	15	9	15
S_2	2	1	3	5	25
S_3	6	4	7	3	20

3. A company wishes to assign 4 jobs to 3 machines. The estimates of the times (in minutes) each machine would take to complete a job is given below. How should the jobs should be allocated to the machines, so that the total cost is minimum?

	Machine		
Jobs	M_1	M_2	M_3
I	8	25	14
II	12	26	5
III	34	19	14
IV	17	29	19

P.T.O

4. Discuss the procedure to solve an optimization problem using dynamic programming. (20)

5. Explain the branch and bound method for solving an Integer programming problem. (20)

6. a)Illustrate Golden Section method with suitable example. (10)
   b) Write a short note on Duality. (10)

7. Write short note on any two from the various Intelligent Techniques of optimization. (20)

--------END--------