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18MAT41

Fourth Semester B.E. Degree Examination, June/July 2024
Complex Analysis, Probability and Statistical Methods

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive Cauchy - Riemann equations in Cartesian form. **(06 Marks)**

b. Show that the function $v = (\sin x \cosh y + 2 \text{ los } x \sinh y) + (x^2 - y^2 + 4xy)$ is harmonic and hence find Analytic function. **(07 Marks)**

c. Verify that $v = \frac{1}{r^2}(\cos 2\theta)$, $r \neq 0$ is harmonic. Find an analytic function f(z) whose real part is u. **(07 Marks)**

OR

2 a. Derive Cauchy-Riemann equations in polar form. **(06 Marks)**

b. Given $f(z) = u + iv$ an analytic function and prove the following property:

$$\left(\frac{\partial}{\partial x}|f(z)|\right)^2 + \left(\frac{\partial}{\partial y}|f(z)|\right)^2 = |f'(z)|^2$$ **(07 Marks)**

c. Find an analytic function $f(z) = u + iv$, given $u - v = e^x(\cos y - \sin y)$ **(07 Marks)**

Module-2

3 a. Discuss the transformation $w = e^z$. Show the transform in z-plane and w-plane. **(06 Marks)**

b. Evaluate $\int_c \frac{e^z}{(z-2)(z-5)^3} dz$, where c is the circle $|z| = 8$. **(07 Marks)**

c. Evaluate $\int_{z=0}^{z=1+i} (x^2 - iy)dz$ along the following curves:

i) The straight line $y = x$ ii) The parabola $y = x^2$. **(07 Marks)**

OR

4 a. Find the bilinear transformation that maps the points $z = -1, i, 1$ onto the points $w = 1, i, -1$ respectively. **(06 Marks)**

b. Discuss the transformation $w = z + \frac{1}{z}$. Show the transform in z and w planes. **(07 Marks)**

c. State and prove Cauchy's integral formula. **(07 Marks)**

Module-3

5 a. Find the value of k such that the following table represents a finite probability distribution:

x :	-3	-2	-1	0	1	2	3
$P(x_i)$:	k	2k	3k	4k	3k	2k	k

Find the mean and the standard deviation of the distribution Also find $P(x > 1)$ and $P(-1 < x \leq 2)$. **(06 Marks)**

b. In a certain factory turning out razor blades, there is a small chance of 0.002, for a blade to be defective. The blades are supplied in packets of 10. Using Poisson distribution, calculate the approximate number of packets containing i) no defective ii) one defective iii) two defective blades in a consignment of 10,000 packets. **(07 Marks)**

c. For the normal distribution with mean 2 and standard deviation 4, calculate the following probabilities:
i) $P(x \geq 5)$ ii) $P\{|x| < 4\}$ iii) $P\{|x| > 3\}$ **(07 Marks)**

OR

6 a. A fair coin is tossed three times. Let x denotes the number of heads showing up. Find the distribution of x. Also find its mean variance and standard deviation. **(06 Marks)**

b. An underground mine has 5 pumps installed for pumping out storm water, the probability of any of the pumps failing during the storm is 1/8. What is the probability that
i) At least 2 pumps will be working ii) All pumps will be working during a particular storm? **(07 Marks)**

c. At a certain city bus stop, three buses arrive per hour on an average. Assuming that the time between successive arrivals is exponentially distributed, find the probability that the time between the arrivals of successive buses is
i) less than 10 minutes ii) at least 30 minutes. **(07 Marks)**

Module-4

7 a. If F is the force required to lift a load W, by mass of a pulley, fit a linear expression $F = a + bW$ against the following data:

W	50	70	100	120
F	12	15	21	25

(07 Marks)

b. Employ the formula $r = \dfrac{\sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2}{2\sigma_x\sigma_y}$ to determine the coefficient of correlation r, for the following data:

x :	92	89	87	86	83	77	71	63	53	50
y :	86	83	91	77	68	85	52	82	37	57

(07 Marks)

c. The tangent of the angle θ between the lines of regression of y on x and x on y is 0.6 and the standard deviation of y is twice the standard deviation of x, find the coefficient of correlation between x and y. **(06 Marks)**

OR

8 a. Fit a second-degree parabola in the form $y = a + bx + cx^2$ for the following data:

x :	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y :	1.1	1.3	1.6	2.0	2.7	3.4	4.1

(06 Marks)

b. Obtain the lines of regression and hence find the coefficient of correlation for the following data:

x :	1	3	4	2	5	8	9	10	13	15
y :	8	6	10	8	12	16	16	10	32	32

(07 Marks)

c. Fit a curve of best fit of the form $y = ax^b$ to the following data:

x :	1	2	3	4	5
y :	0.5	2	4.5	8	12.5

(07 Marks)

Module-5

9 a. The joint probability function for two discrete random variables X and Y is given by $f(x, y) = c(2x + y)$ where x and y can assume all integral values such that $0 \le x \le 2$ and $0 \le y \le 3$ and $f(x, y) = 0$ otherwise.
Find i) The value of constant c ii) $P(X = 2, Y = 1)$ iii) $P(X \ge 1, Y \le 2)$ iv) $P[(x + y) \le 1]$ **(10 Marks)**

b. Define Type-I and Type-II errors. A coin was tossed 400 times and returned heads 216 times. Test the hypothesis that the coin is unbiased. **(10 Marks)**

OR

10 a. The life time of electric bulbs for a random sampling of 10from a large shipment gave the following data:

Item	1	2	3	4	5	6	7	8	9	10
Life in '1000s of hrs	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average life time of bulbs is 4000 hrs. **(10 Marks)**

b. A joint distribution is given by the following table:

X \ Y	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

Find the marginal distribution of X and Y evaluate μ_X , μ_Y , σ_X, σ_Y. **(10 Marks)**

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18MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2024
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Test for consistency and solve
$5x+3y+7z=5$, $3x+26y+2z=9$, $7x+2y+10z=5$ **(07 Marks)**

b. Find the eigen values and the corresponding eigen vectors for the matrix
$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. **(07 Marks)**

c. Solve the system of equations by Gauss-Elimination method :
$2x+y+4z=12$, $4x+11y-z=33$, $8x-3y+2z=20$ **(06 Marks)**

OR

2 a. Find the rank of the matrix $A=\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. **(07 Marks)**

b. Investigate the value of λ and μ such that the system of equations,
$x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ may have,
(i) Unique solution
(ii) Infinite solution
(iii) No solution **(07 Marks)**

c. Solve the system of equations by Gauss-elimination method :
$x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$ **(06 Marks)**

Module-2

3 a. Find y(1.4) given that,

x	1	2	3	4	5
y	10	26	58	112	194

Using Newton's forward interpolation formula. **(07 Marks)**

b. Find a real root of $f(x)=x^3-2x-5=0$, correct to three decimal places, using Regula-Falsi method. **(07 Marks)**

c. Evaluate $\int_0^6 3x^2dx$ dividing the interval [0, 6] into SIX equal parts by applying Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule. **(06 Marks)**

OR

4 a. Given $f(40)=184$, $f(50)=204$, $f(60)=226$, $f(70)=250$, $f(80)=276$, $f(90)=304$, find f(85) using Newton's backward interpolation formula. **(07 Marks)**

b. Find the real root of the equation $f(x)=xe^x-2=0$ correct to three decimal places, by using Newton-Raphson method. **(07 Marks)**

c. Evaluate $\int_4^{5.2} \log_e x \, dx$, taking 6 equal strips by applying Weddle's rule :

x	4	4.2	4.4	4.6	4.8	5.0	5.2
$y=\log_e x$	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

(06 Marks)

Module-3

5 a. Solve : $(4D^4-4D^3-23D^2+12D+36)y=0$. **(07 Marks)**

b. Solve : $(6D^2+17D+12)y=e^{-x}$ **(07 Marks)**

c. Solve : $y''+9y=\cos 2x \cos x$ **(06 Marks)**

OR

6 a. Solve : $(D^3-2D^2+4D-8)y=0$ **(07 Marks)**

b. Solve : $(D^2-4D+13)y=e^{2x}$ **(07 Marks)**

c. Solve : $(D^2-8D+9)y=8\sin 5x$ **(06 Marks)**

Module-4

7 a. Form the PDE, by eliminating the arbitrary function from $z=f(x^2+y^2)$ **(07 Marks)**

b. Solve : $\frac{\partial^2 z}{\partial x \partial y}=x^2y$, by direct integration. **(07 Marks)**

c. Solve : $\frac{\partial^2 z}{\partial x^2}-a^2z=0$ under the conditions $z=0$ and $\frac{\partial z}{\partial x}=a\sin y$ when $x=0$. **(06 Marks)**

OR

8 a. Solve the equation $\frac{\partial^2 z}{\partial x^2}+z=0$, given that $z=e^y$ and $\frac{\partial z}{\partial x}=1$ when $x=0$. **(07 Marks)**

b. Solve : $\frac{\partial^2 z}{\partial x \partial y}=\frac{x}{y}$ subject to the conditions $\frac{\partial z}{\partial x}=\log_e x$ when $y=1$ and $z=0$ when $x=1$. **(07 Marks)**

c. Form the PDE, by eliminating the arbitrary constants a and b from the equation : $z=a\log(x^2+y^2)+b$ **(06 Marks)**

Module-5

9 a. In a certain computer centre, 47% of the programmers can program in FORTRAN 35% in PASCAL and 20% in COBOL and every programmer can program in at least one of these languages. If the probability that a randomly chosen programmer can program in FORTRAN and PASCAL is 0.23, COBOL and FORTRAN is 0.12, PASCAL and COBOL is 0.11, determine the probability that a randomly chosen programmer can program in all three languages. **(07 Marks)**

b. Three students x, y, z write an examination. Their chances of passing are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. Find the probability that, (i) All of them pass (ii) at least one of them passes and (iii) at least two of them pass. **(07 Marks)**

c. A person is known to speak truth 3 out of 4 times. He throws a die and reports that the die shows a six. Find the probability that it is actually a SIX. **(06 Marks)**

OR

10 a. Find the probability that the birth days of 5 persons chosen at random will fall in 12 different calendar months. **(07 Marks)**

b. If A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$, $P(A \cap \overline{B}) = \frac{1}{3}$, find $P(A)$, $P(B)$ and $P(\overline{A} \cap B)$. **(07 Marks)**

c. Given $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ and $P(AUB) = \frac{1}{2}$, evaluate $P\left(A/B\right)$, $P\left(B/A\right)$, $P\left(A \cap \overline{B}\right)$ and $P\left(A/B\right)$. **(06 Marks)**

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18CS42

Fourth Semester B.E. Degree Examination, June/July 2024
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define an algorithm. Design an algorithm to search an element in an array of elements using sequential search. Discuss worst, best and average efficiency of the algorithm. **(08 Marks)**

b. Explain the asymptotic notations: i) Big-oh (O) ii) Big omega (Ω) iii) Theta (θ) with an example for each. Also prove that: If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then $t_1(n) + t_2(n) \in O(\max \{g_1(n), g_2(n)\})$. **(08 Marks)**

c. Discuss adjacency matrix and adjacency list representation of a graph with suitable examples. **(04 Marks)**

OR

2 a. Write a recursive algorithm to print all the permutations of a set of $n \geq 1$ elements. Also write a recursive tree of calls for $n = 3$. **(08 Marks)**

b. Give a general plan for analyzing recursive algorithms. Give a recursive algorithm to find the number of binary digits in the binary representation of a positive decimal integer and obtain its efficiency. **(08 Marks)**

c. Explain with an example, how to convert ordered rooted tree into a binary tree. **(04 Marks)**

Module-2

3 a. Given a bag of 16 coins and let seventh one be the counterfeit coin among 16 coins. Counterfeit coins are lighter than genuine ones. Given a machine to compare the weights of two sets of coins, apply divide and conquer to determine that 7^{th} is counterfeit **(06 Marks)**

b. Apply merge sort to sort the following numbers in ascending order: 8, 3, 2, 9, 7, 1, 5, 4. Also obtain time complexity for merge sort. **(08 Marks)**

c. Apply divide and conquer approach to multiply the following matrices:

$$\begin{bmatrix} 5 & 2 & 6 & 1 \\ 0 & 6 & 2 & 0 \\ 3 & 8 & 1 & 4 \\ 1 & 8 & 5 & 6 \end{bmatrix} \times \begin{bmatrix} 7 & 5 & 8 & 0 \\ 1 & 8 & 2 & 6 \\ 9 & 4 & 3 & 8 \\ 5 & 3 & 7 & 9 \end{bmatrix}$$

(06 Marks)

OR

4 a. Write an iterative algorithm for binary search and trace the algorithm to search for a key 151 in a list -15, -6, 0, 7, 9, 23, 54, 82, 101, 112, 125, 131, 142, 151. **(06 Marks)**

b. Write quicksort algorithm to sort 'n' numbers and apply the same to sort the following numbers in ascending order. 80, 60, 70, 40, 10, 30, 50, 20. **(08 Marks)**

c. Apply DFS and source vertex removal methods to obtain topological sequence for two graph shown in Fig.Q.4(c) **(06 Marks)**

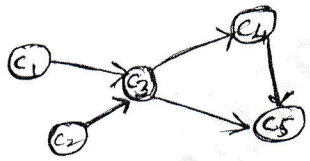

Fig.Q.4(c)

Module-3

5 a. Apply greedy method to obtain an optimal task assignment for the 7 tasks and infinite supply of machines given their start end times.

Task	a	b	c	d	e	f	g
Start time	0	3	4	9	7	1	6
End time	2	7	7	11	10	5	8

(06 Marks)

b. Solve the following knapsack problem using all 3 greedy criteria: m = 20, n = 3, p = (25, 24, 15) w = (18, 15, 10). **(06 Marks)**

c. Write and apply kruskals algorithm to obtain minimum cost spanning tree for the graph shown in Fig.Q.5(c). **(08 Marks)**

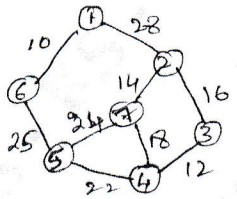

Fig.Q.5(c)

OR

6 a. Write and apply prims algorithm to obtain minimum cost spanning tree for the graph shown in Fig.Q.5(c). **(08 Marks)**

b. Apply Dijkstra algorithm to find the shortest distance from vertex 1 to all nodes in a graph shown in Fig.Q.6(b) **(06 Marks)**

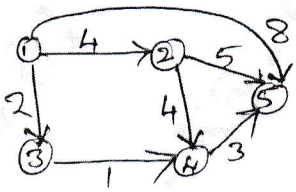

Fig.Q.6(b)

c. Determine the optimal prefix code for the symbols a, o, q, u, y, z that occur with frequencies: 20, 28, 4, 17, 12, 7 respectively. **(06 Marks)**

Module-4

7 a. Define multistage graph problem and write the forward approach algorithm to obtain a solution. **(06 Marks)**

b. Write Floyd's algorithm to solve all pairs shortest path problem and apply the same for the graph shown in Fig.Q.7(b). **(08 Marks)**

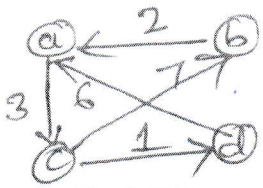

Fig.Q.7(b)

c. Find optimal tour for the travelling sales person problem using dynamic programming technique for the graph shown in Fig.Q.7(c) considering initial and end vertex as 1. **(06 Marks)**

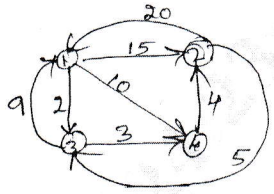

Fig.Q.7(c)

OR

8 a. Define transitive closure of a digraph. Find the transitive closure matrix for the graph whose adjacency matrix is $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ **(08 Marks)**

b. Write the algorithm to construct optimal binary search tree for the following data:

Key	A	B	C	D
Probability	0.1	0.2	0.4	0.3

(12 Marks)

Module-5

9 a. Define n-queens problem. Construct state-space tree for solving 4-queens problem using backtracking for all possible solutions. **(08 Marks)**

b. Solve the following assignment problem using branch and bound technique, whose cost matrix for assigning four jobs to four persons are given.

$\begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix}$ **(06 Marks)**

c. Explain the classes of NP-hard and NP-complete. **(06 Marks)**

OR

10 a. State the subset sum problem. Using backtracking, obtain a solution to the subset sum problem given s = {6, 8, 2, 14} and d = 16. **(06 Marks)**

b. Construct a space tree representing all possible colorings using atmost 3 colors for the graph shown in Fig.Q.10(b). **(07 Marks)**

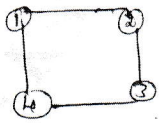

Fig.Q.10(b)

c. With the help of a state-space tree, solve the travelling sales person problem Fig.Q.10(c) using branch-and-bound technique. **(07 Marks)**

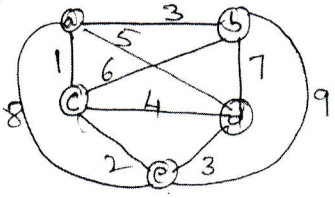

Fig.Q.10(c)

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18CS43

Fourth Semester B.E. Degree Examination, June/July 2024
Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain what is an operating systems. Discuss the role of operating system from different view points. **(06 Marks)**

b. Explain the dual mode of operation of an operating system. **(07 Marks)**

c. List and explain the different states of process with a neat diagram. **(07 Marks)**

OR

2 a. With a neat diagram, explain the concept of virtual machine. **(07 Marks)**

b. What are system calls? Explain the handling of open ( ) system call. **(07 Marks)**

c. List the different operating system services and explain. **(06 Marks)**

Module-2

3 a. Explain the different multi threading models with a diagram. List out the different threading issues with multi threaded models. Explain any one. **(10 Marks)**

b. Calculate the average waiting time by drawing Gantt chart using first come first serve, shortest job first and round robin scheduling algorithms for the following process. Time quantum = 4

Process	Burst time
P_0	24
P_1	3
P_2	3

(10 Marks)

OR

4 a. What is a critical section problem? List and explain the solution to this problem using Peterson's algorithm. **(10 Marks)**

b. What is Bounded Buffer problem? Explain how semaphores can be used for synchronization in this problem. **(10 Marks)**

Module-3

5 a. What is a deadlock? Explain how can it be prevented. **(10 Marks)**

b. Explain Banker's algorithm for deadlock avoidance. **(10 Marks)**

OR

6 a. Given a system with total resources A(3) ; B(14) and C(12), determine whether the following system is in safe state or not using Banker's algorithm.

	Allocation			Max			Availability		
	A	B	C	A	B	C	A	B	C
P_0	0	0	1	0	0	1	1	5	2
P_1	1	0	0	1	7	5			
P_2	1	3	5	2	3	5			
P_3	0	6	3	0	6	5			
P_4	0	0	1	0	6	5			

Justify can $P_1(0, 0, 1)$ request be granted immediately? **(10 Marks)**

b. Explain the concept of paging with a neat diagram. **(10 Marks)**

Module-4

7 a. What is demand paging? Explain the steps in handling a page fault with a neat diagram. **(10 Marks)**

b. Consider the following page reference stream,
7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1
How many page faults would occur for LRU and FIFO page replacement algorithms assuming 3 Frames? What is Belady's anomaly? **(10 Marks)**

OR

8 a. Explain the two structures used to implement file systems. **(10 Marks)**

b. List the different methods of disk allocation and explain any one. **(05 Marks)**

c. List the different free space management approaches and explain any two. **(05 Marks)**

Module-5

9 a. Explain access matrix and list its implementation. **(10 Marks)**

b. Explain various disk scheduling algorithms with an example. **(10 Marks)**

OR

10 a. Explain the various components of the Linux system. **(10 Marks)**

b. Explain disk formatting, boot block and bad block. **(10 Marks)**

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18CS44

Fourth Semester B.E. Degree Examination, June/July 2024
Microcontroller and Embedded Systems

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the different processor modes provided by ARM7. **(05 Marks)**

b. Explain the major design rules to implement the RISC philosophy. **(05 Marks)**

c. Explain ARM core data flow model with neat diagram. **(10 Marks)**

OR

2 a. Explain the programmer's model of ARM processors with complete register sets available. **(04 Marks)**

b. Describe conditional execution. Write the different code suffix. **(06 Marks)**

c. What is pipelining? Explain in detail schematically. **(10 Marks)**

Module-2

3 a. With a neat diagram, explain Barrel Shifter. **(06 Marks)**

b. Discuss the load and store instructions with respect to the Single Register Transfer. **(08 Marks)**

c. How Register Allocation is done? Explain. **(06 Marks)**

OR

4 a. Explain about instruction scheduling. **(04 Marks)**

b. Define instruction scheduling. Explain the rules summarizing the cycle timings for common instruction classes on the ARM9 TDMI. **(06 Marks)**

c. Write notes on Profiling and Cycle Counting. **(10 Marks)**

Module-3

5 a. Differentiate Embedded Systems and General Purpose Computing Systems. **(04 Marks)**

b. Write short notes on: (i) Real Time Clock (ii) Watch Dog Timer **(06 Marks)**

c. Explain the system core of the Embedded Systems. **(10 Marks)**

OR

6 a. What are the different types of memories used in Embedded System Design? Explain the role of each. **(10 Marks)**

b. Explain the different step modes for stepper motor. **(10 Marks)**

Module-4

7 a. Explain Quality Attribute in embedded system development. What are the different Quality Attribute to be considered in an embedded system design? **(10 Marks)**

b. With the functional block diagram, explain the operation of washing machine as application specific embedded system. **(10 Marks)**

OR

8 a. Explain with neat block diagram, how source file to object file translation takes place. **(10 Marks)**

b. Explain two basic approaches for designing embedded firmware. **(10 Marks)**

Module-5

9 a. Explain Multi Threading. **(06 Marks)**

b. Define the term Task, Process and Threads. Explain the process structure, process states and state transitions. **(10 Marks)**

c. Explain different types of multitasking. **(04 Marks)**

OR

10 a. Explain the role of Integrated Development Environment (IDE) for Embedded Software Development. **(08 Marks)**

b. Highlight the functional and non-functional requirements to be considered while choosing an RTOS for an embedded design. **(08 Marks)**

c. Explain Round Robin process scheduling with interrupts. **(04 Marks)**

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18CS45

Fourth Semester B.E. Degree Examination, June/July 2024
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain various features of Object Oriented Paradigm. **(08 Marks)**

b. "Name Space helps in preventing pollution of Global name space". Justify. **(04 Marks)**

c. What is function overloading? Write a C++ program with three overloaded function to find, sum of two integers sum of two floating point number and sum of three integers. **(08 Marks)**

OR

2 a. List the difference between object oriented programming and procedure oriented programming? Mention the drawbacks of procedure oriented programming. **(08 Marks)**

b. Explain inline function with an example. List out the conditions where inline function cannot be used. **(04 Marks)**

c. Write a C++ program to create a student class with member variables : Stud_id, Stud_name and Marks for three test, Member function : to get the data using getdata( ), display data on Console using display ( ). **(08 Marks)**

Module-2

3 a. Demonstrate array declaration, array initialization and print first n Even numbers in array using for-each loop in Java. **(08 Marks)**

b. How "Compile once run anywhere" is implemented in Java? **(04 Marks)**

c. Explain the structure of Java program and its keywords with example. **(08 Marks)**

OR

4 a. List and explain Java Buzzword. **(08 Marks)**

b. Explain constructor and write a program for copyconstructor in C++. **(04 Marks)**

c. Define polymorphism. Explain different types of polymorphism with example. **(08 Marks)**

Module-3

5 a. Describe the various levels of access protection available for classes and their implementation with suitable example. **(08 Marks)**

b. Explain usage of super in Java with example. **(08 Marks)**

c. Give the importance of finalize ( ) method in garbage collection. **(04 Marks)**

OR

6 a. Elucidate the concept of inheritance and its classification using suitable sketches. **(08 Marks)**

b. Write a Java program to illustrate Exception handling when a number in divided by zero and array has a negative index value. **(08 Marks)**

c. When constructors are called in class hierarchy. **(04 Marks)**

Module-4

7 a. Briefly explain role of interfaces while implementing multiple inheritance in Java with example. **(08 Marks)**

b. Define package. What are the steps involved in creating user defined package with example. **(04 Marks)**

c. How synchronization can be achieved between threads in Java? Explain with example. **(08 Marks)**

OR

8 a. Define the concept of multithreading in Java and explain different phases in life-cycle of a thread. **(08 Marks)**

b. Explain isalive ( ) and join ( ) function in Thread with example. **(04 Marks)**

c. Explain producer and consumer problem with example. **(08 Marks)**

Module-5

9 a. Explain the delegation Event model used to handle events in Java. What are events, event listeners and event handler in Java. **(10 Marks)**

b. Explain key features of swings, write a swing program for implementing jbuttons. **(10 Marks)**

OR

10 a. Explain Adapter class and Inner class in detail. **(10 Marks)**

b. Write a brief note on components and containers in swings. Explain Jcombobox, JTextfield and Jlist with suitable code. **(10 Marks)**

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CBCS SCHEME

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18CS46

Fourth Semester B.E. Degree Examination, June/July 2024
Data Communication

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define Data Communication. Explain fundamental characteristics of data communication system. **(06 Marks)**

b. State five basic data communication components, briefly explain their functions. **(06 Marks)**

c. What are the advantages of having layered model for networking? Explain important functions of OSI model. **(08 Marks)**

OR

2 a. What is Transmission Impairment? Briefly explain three causes of transmission impairment. **(06 Marks)**

b. Explain briefly about Shanon capacity and Nyquist bit rate for communication channels. **(06 Marks)**

c. Distinguish :
i) Baseband and Broadband
ii) Bandwidth and Throughptut
iii) Latency and Jitter
iv) Dejure and Defacto model. **(08 Marks)**

Module-2

3 a. Define Line Coding. List out its characteristics. **(08 Marks)**

b. Explain different data transmission modes in detail. **(07 Marks)**

c. Represent the sequence 1011001011 using polar and biphase schemes. **(05 Marks)**

OR

4 a. Explain with suitable diagram PCM encoder used for analog to digital conversion. **(08 Marks)**

b. Briefly explain with neat diagrams, ASK and FSK modulation techniques and specify the bandwidth requirement. **(08 Marks)**

c. We have an available bandwidth of 100 kHz which spans from 200 to 300 kHz. What are the carrier frequency and the bit rate if we modulated our data by using ASK with d = 1. **(04 Marks)**

Module-3

5 a. What is Switching? What are the different types of switching techniques? **(06 Marks)**

b. What is Hamming distance? Discuss about minimum Hamming distance. **(06 Marks)**

c. Explain the need for multiplexing. Four 1kbps connections are multiplexed together. A unit is 1 bit find :
i) The duration of 1 bit before multiplexing
ii) The transmission rate of the link
iii) The duration of a time slot
iv) The duration of a frame. **(08 Marks)**

OR

6 a. Describe about Direct Sequence Spread Spectrum (DSSS). **(06 Marks)**
b. Distinguish statistical TDM from synchronous TDM. **(06 Marks)**
c. Explain Cycle Redundancy Check (CRC). Assume that data is 10110 and the code generator is 1101. Calculate CRC bits. **(08 Marks)**

Module-4

7 a. Demonstrate taking an example, character oriented and bit oriented framing. **(10 Marks)**
b. A network transmit 200bit frames on a shared 200 Kbps line. Compute the throughout for pure ALOHA and slotted ALOHA if the system produces
i) 1000 frames/sec ii) 500 frames/sec iii) 250 frames/sec.
Tabulate the values computed. **(10 Marks)**

OR

8 a. Demonstrate the concept of IP address and Link – layer address, consider a small internet. **(07 Marks)**
b. What is the role of Address Resolution Protocol (ARP)? Explain its Operation. **(07 Marks)**
c. What is Classless Inter Domain Routing (CIDR)? Explain Address Aggregation Strategy with example. **(06 Marks)**

Module-5

9 a. Explain Ethernet frame format with a neat diagram. **(08 Marks)**
b. Describe Gigabit Ethernet. **(06 Marks)**
c. Explain the architecture of IEEE 802.11. **(06 Marks)**

OR

10 a. Explain the architecture of Bluetooth. **(08 Marks)**
b. Explain the operation of cellular telephony. **(06 Marks)**
c. Explain fourth generation (4G) of cellular telephony. **(06 Marks)**

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