CBCS SCHEME

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18MAT41

Fourth Semester B.E. Degree Examination, July/August 2022
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 equation in Polar form. (06 Marks)

b. Find the analytic function f(z) whose real part is
$x \sin x \cosh y - y \cos x \sinh y$ (07 Marks)

c. If f(z) is analytic show that
$$\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]|f(z)|^2 = 4|f'(z)|^2$$ (07 Marks)

OR

2 a. Find the analytic function f(z) given that the sum of its real and imaginary part is
$x^3 - y^3 + 3xy(x-y)$ (06 Marks)

b. Find the analytic function $f(z) = u + iv$ if
$v = r^2\cos 2\theta - r\cos\theta + 2$ (07 Marks)

c. If f(z) is analytic function then show that
$$\left\{\frac{\partial}{\partial x}|f(z)|\right\}^2+\left\{\frac{\partial}{\partial y}|f(z)|\right\}^2 = |f'(z)|^2$$ (07 Marks)

Module-2

3 a. State and prove Cauchy's Integral formula. (06 Marks)

b. Evaluate $\int_0^{2+i}\bar{z}^2 dz$ along (i) the line $y = \frac{x}{2}$ (ii) The real axis to 2 and then vertically to 2 + i.
(07 Marks)

c. Find the bilinear transformation which maps the points 1, i, –1 onto the points i, 0, –i respectively. (07 Marks)

OR

4 a. Discuss the transformation $w = e^z$, with respect to straight lines parallel to x and y axis.
(06 Marks)

b. Using Cauchy's integral formula evaluate
$$\int_c \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)}dz \text{ , where } c: |z| = 3$$ (07 Marks)

c. Find the bilinear transformation which maps the points 0, 1, ∞ on to the points –5, –1, 3 respectively. (07 Marks)

Module-3

5 a. A random variable X has the following probability function for various values of X.

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Find i) k ii) $P(X < 6)$ iii) $P(3 < X \le 6)$ (06 Marks)

b. Out of 800 families with 5 children each, how many families would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atmost 2 girls, assuming equal probabilities for boys and girls. **(07 Marks)**

c. The length in time (minutes) that a certain lady speaks on a telephone is a random variable with probability density function

$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find the value of the constant A. What is the probability that she will speak over the phone for (i) More than 10 minutes (ii) Less than 5 minutes (iii) Between 5 and 10 minutes. **(07 Marks)**

OR

6 a. Find the constant C such that the function

$$f(x) = \begin{cases} Cx^2, & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$ is a probability density function. Also compute $P(1 < x < 2)$, $P(x \leq 1)$ and $P(x > 1)$ **(06 Marks)**

b. 2% fuses manufactured by a firm are found to be defective. Find the probability that the box containing 200 fuses contains

(i) No defective fuses (ii) 3 or more defective fuses (iii) At least one defective fuse. **(07 Marks)**

c. If x is a normal variate with mean 30 and standard deviation 5 find the probabilities that (i) $26 < x \leq 40$ (ii) $x \geq 45$ (iii) $|x - 30| > 5$

Given that $\phi(1) = 0.3413$, $\phi(0.8) = 0.2881$, $\phi(2) = 0.4772$, $\phi(3) = 0.4987$ **(07 Marks)**

Module-4

7 a. The following table gives the ages (in years) of 10 married couples. Calculate Karl Pearson's coefficient of correlation between their ages:

Age of husband (x)	23	27	28	29	30	31	33	35	36	39
Age of wife (y)	18	22	23	24	25	26	28	29	30	32

(06 Marks)

b. In a partially destroyed laboratory record of correlation data only the following results are available:

Variance of x is 9 and regression lines are $8x - 10y + 66 = 0$, $40x - 18y = 214$. Find

(i) Mean value of x and y

(ii) Standard deviation of y

(iii) Coefficient of correlation between x and y. **(07 Marks)**

c. Fit a parabola of the form $y = ax^2 + bx + c$ for the data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(07 Marks)

OR

8 a. Obtain the lines of regression and hence find the coefficient of correlation of the data:

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

(06 Marks)

b. Show that if θ is the angle between the lines of regression

$$\tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}\left(\frac{1 - r^2}{r}\right)$$ **(07 Marks)**

c. Fit a straight line $y = a + bx$ to the data

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

(07 Marks)

Module-5

9 a. The joint probability distribution of the random variables X and Y is given below.

X \ Y	-4	2	7
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Find (i) E[X] and E[Y] (ii) E[XY] (iii) cov(X, Y) iv) $\rho(X, Y)$.
Also, show that X and Y are not independent. (06 Marks)

b. A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 of them were faulty. Test his claim at a significance level of 1% and 5% ($z_{0.05} = 1.96$, $z_{0.01} = 2.58$). (07 Marks)

c. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure ($t_{0.05}$ for 11 d.f. is 2.201) (07 Marks)

OR

10 a. Define the terms :
(i) Null hypothesis (ii) Type-I and Type – II errors (iii) Significance level (06 Marks)

b. In an experiment of pea breeding the following frequencies of seeds were obtained:

Round Yellow	Wrinkled Yellow	Round Green	Wrinkled Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in proportions 9:3:3:1
Is the experiment in agreement with theory ($\chi^2_{0.5}$ for 3 d.f is 7.815) (07 Marks)

c. The joint probability distribution of two discrete random variable X and Y is given by $f(x, y) = k(2x + y)$ where x and y are integers such that $0 \le x \le 2$, $0 \le y \le 3$. Find k and the marginal probability distribution of X and Y. Show that the random variables X and Y are dependent. Also, find $P(X \ge 1, Y \le 2)$. (07 Marks)

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18MATDIP41

Fourth Semester B.E. Degree Examination, July/August 2022
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. Find the rank of the matrix

$$A = \begin{bmatrix} 1 & 0 & -3 & -1 \\ 0 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$ (06 Marks)

b. Solve the system of equations: $x + y + z = 9$; $x - 2y + 3z = 8$; $2x + y - z = 3$ by Gauss elimination method. (07 Marks)

c. Find all the eigen values and corresponding eigen vectors of $\begin{pmatrix} -5 & 9 \\ -6 & 10 \end{pmatrix}$ (07 Marks)

OR

2 a. Find the rank of the matrix

$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{pmatrix}$$ (06 Marks)

b. Using Gauss elimination method solve the system of equations
$x + 2y + 3z = 6$; $2x + 4y + z = 7$; $3x + 2y + 9z = 14$. (07 Marks)

c. Find the eigen values of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 0 & -2 & 6 \\ 0 & 0 & -3 \end{pmatrix}$ (07 Marks)

Module-2

3 a. Use an appropriate Interpolation formula to compute f(6).

x	1	2	3	4	5
y	1	-1	1	-1	1

(07 Marks)

b. Evaluate $\int_0^6 3x^2 dx$ by using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by taking n = 6. (07 Marks)

c. Find a real root of the equation $x^3 - 2x - 5 = 0$ by Newton Raphson method. (06 Marks)

OR

4 a. Find solution using Newton's Interpolation formula, at $x = -1$.

x	0	1	2	3
f(x)	1	0	1	10

(07 Marks)

b. Find the real root of the equation $\cos x = 3x - 1$ using Regula Falsi method. **(07 Marks)**

c. Evaluate $\int_4^{5.2} \log_e x$ taking n = 6 by Weddle's rule. **(06 Marks)**

Module-3

5 a. Solve : $(D^3 - 2D^2 + 4D - 8)y = 0$ **(06 Marks)**

b. Solve : $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{2x}$ **(07 Marks)**

c. Solve : $\frac{d^2y}{dx^2} + 4y = \cos 4x$ **(07 Marks)**

OR

6 a. Solve : $\frac{d^3y}{dx^3} - 3\frac{dy}{dx} + 2y = 0$ **(06 Marks)**

b. Solve : $(D^2 - 6D + 9)y = 7e^{-2x} - \log 2$ **(07 Marks)**

c. Solve : $\frac{d^2y}{dx^2} - 16y = \sin 16x$ **(07 Marks)**

Module-4

7 a. Form the partial differential equation by eliminating the arbitrary constants from $z = (x - a)^2 + (y - b)^2$ **(06 Marks)**

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

c. Solve : $\frac{\partial^2 z}{\partial y^2} - z = 0$; given that $z = \cos x$ and $\frac{\partial z}{\partial y} = \sin x$, when $y = 0$. **(07 Marks)**

OR

8 a. Form the partial differential equation by eliminating the arbitrary function 'f' from $f(x^2 + y^2, z - xy) = 0$ **(06 Marks)**

b. Solve the equation $\frac{\partial^2 z}{\partial y^2} = \sin xy$ **(07 Marks)**

c. Form the partial differential equation by eliminating the arbitrary constants

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$ **(07 Marks)**

Module-5

9 a. Define : (i) Mathematical definition of probability
(ii) Mutually exclusive events
(iii) Independent events **(06 Marks)**

b. If A and B are two events with $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$.

Find (i) P(A/B) (ii) P(B/A) (iii) $P(\overline{A}/\overline{B})$ (iv) $P(\overline{B}/\overline{A})$ **(07 Marks)**

c. In a bolt factory there are four machines A, B, C, D manufacturing respectively 20%, 15%, 25%, 40% of the total production. Out of these 5%, 4%, 3%, 2% are defective. If a bolt drawn at random was found defective, what is the probability that it was manufactured by A? **(07 Marks)**

OR

10 a. State and prove Baye's theorem. **(06 Marks)**

b. A card is drawn at random from a pack of cards. (i) What is the probability that it is a heart? (ii) If it is known that the card drawn is red, what is the probability that it is a heart? **(07 Marks)**

c. An Urn 'A' contains 2 white and 4 black balls. Another Urn 'B' contains 5 white and 7 black balls. A ball is transferred from the Urn A to the Urn B. Then a ball is drawn from the Urn B. Find the probability that it is white. **(07 Marks)**

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18CS42

Fourth Semester B.E. Degree Examination, July/August 2022
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. Give the definition of an Algorithm and also discuss the characteristics of an Algorithm. **(05 Marks)**

b. Define Space Complexity and Time Complexity of an algorithm and compute the time complexity of Fibbonocci Numbers algorithm. **(05 Marks)**

c. What are the various basic Asymptotic efficiency classes? Explain Big – O , Big - Ω , Big - θ notations with examples. **(10 Marks)**

OR

2 a. Give the Mathematical Analysis of Non recursive Matrix Multiplication Algorithm. **(05 Marks)**

b. Give the general plan for analyzing Time efficiency of Recursive algorithms and also Analyze the Tower of Hanoi Recursive algorithm. **(10 Marks)**

c. Mention the important problem types considered for design and analysis. Explain any two problem types. **(05 Marks)**

Module-2

3 a. Give the Recursive algorithm to find maximum and minimum element from the list and apply the algorithm to find maximum and minimum to the list
[31 , 22 , 12 , -7 , 75 , -6 , 17 , 47 , 60]. **(10 Marks)**

b. Apply both mergesort and quicksort algorithm to sort the characters VTUBELAGAVI. **(10 Marks)**

OR

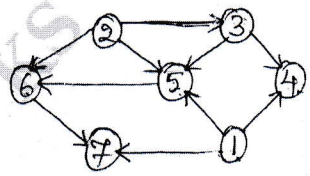
4 a. Apply Strassen's algorithm for matrix multiplication to multiply the following matrices and justify how the Strassen's algorithm is better.

$$\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 6 & 5 \end{bmatrix}.$$

(10 Marks)

b. Obtain the topological sort for the graph , Fig. Q4(b) using i) Source Removal method ii) DFS method. **(10 Marks)**

Fig. Q4(b)



Module-3

5 a. Solve the Greedy Knapsack problem, Fig, Q5(a) of capacity 5kgs. **(05 Marks)**

Fig. Q5(a)

Items	1	2	3	4
Profit	5	9	4	8
Weight	1	3	2	2

b. Find the Optimal solution for the Greedy Job sequencing problem given n = 4 , profits [10 , 30 , 60 , 40] , deadlines [2 , 3 , 1 , 3]. **(05 Marks)**

c. Apply Prims and Kruskal's algorithm to find the minimal cost spanning tree for the graph given in Fig. Q5(c). **(10 Marks)**

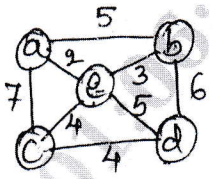


Fig. Q5(c)

OR

6 a. A document contains the letters "A" through "E" with frequencies is follows :
A : 22 , B : 13 , C : 18 , D : 16 , E : 31.
Construct a Huffman Tree and codes and
Encode : CAB , ADD , BAD , ACE
Decode : 110011 and 1000110001. **(10 Marks)**

b. Apply Heapsort for the list [9 , 7 , 1 , 8 , 3 , 6 , 2 , 4 , 10 , 5] using Bottom up approach. **(10 Marks)**

Module-4

7 a. Apply Floyd's algorithm to find the all pairs shortest path for the given adjacency matrix. Fig. Q7(a).

$$W = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} \begin{array}{c} \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{bmatrix} 0 & 1 & \infty & 1 & 5 \\ 9 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix} \end{array}$$

Fig. Q7(a) **(10 Marks)**

b. Solve the instance of 0/1 Knapsack problem Fig. Q7(b), using Dynamic Programming approach. **(10 Marks)**

Item	Weight	Value
1	2	$ 12
2	1	$ 10
3	3	$ 20
4	2	$ 15

Capacity W = 5

Fig. Q7(b)

OR

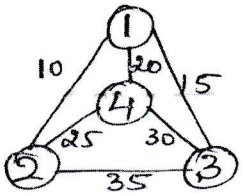
8 a. Construct an Optimal Binary search tree for the set of keys given in Fig. Q8(a). **(10 Marks)**

Keys	A	B	C	D
Probability	0.1	0.2	0.4	0.3

Fig. Q8(a)

b. Apply Dynamic programming approach to solve the given Travelling Salesman problem. **(10 Marks)**

Fig. Q8(b)

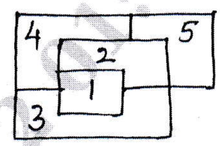


Module-5

9 a. With the help of State Space tree, solve the 4 – queens problem by using Backtracking approach. **(10 Marks)**

b. Color the regions in the Map given in Fig. Q9(b), by applying backtracking graph color algorithm. Color = (R G B & Y). **(10 Marks)**

Fig. Q9(b)



OR

10 a. Apply LC – Branch and Bound approach to the assignment problem Fig. Q10(a). **(10 Marks)**

Fig. Q10(a)

$$C = \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \begin{matrix} \text{Person a} \\ \text{Person b} \\ \text{Person c} \\ \text{Person d} \end{matrix}$$

(Columns: 1 2 3 4)

b. Apply Branch and Bound approach to solve the instance of 0/1 Knapsack problem.

KnapSack Capacity W = 10

Items	1	2	3	4
Weight	4	7	5	3
Value	$ 40	$ 42	$ 25	$ 12

Fig. Q10(b) **(10 Marks)**

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18CS43

Fourth Semester B.E. Degree Examination, July/August 2022
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. Distinguish between the following terms:
i) Multi programming and multitasking.
ii) Multi processor systems and clustered systems. **(10 Marks)**

b. Define Operating Systems. Explain dual mode of operating systems with a neat diagram. **(05 Marks)**

c. Explain about system calls with an example of handling a user application invoking the open( ) system call. **(05 Marks)**

OR

2 a. What is a process? Illustrate with a neat diagram the different states of a process and control block. **(05 Marks)**

b. Discuss the implementation of IPC using message passing systems in detail. **(10 Marks)**

c. List and explain the services provided by OS for the user and efficient operation of system. **(05 Marks)**

Module-2

3 a. Give a brief description about multithreading and explain the different multi threading models. **(05 Marks)**

b. Discuss the issues that come with multithreaded programming. **(10 Marks)**

c. Explain CPU scheduling criteria. **(05 Marks)**

OR

4 a. Calculate the average waiting time and the average turnaround time by drawing the Gantt chart using FCFS, SRTF, RR (q = 2ms) and priority algorithms. Lower priority number represents higher priority.

Process	Arrival Time	Burst Time	Priority
P_1	0	9	3
P_2	1	4	2
P_3	2	9	1
P_4	3	5	4

(12 Marks)

b. What is critical section problem? What are the requirements for the solution to critical section problem? Explain Peterson's solution. **(08 Marks)**

Module-3

5 a. What is a deadlock? What are the necessary conditions for the deadlock to occur? **(05 Marks)**

b. How to prevent the occurrence of deadlock, explain in detail. **(05 Marks)**

c. Consider the following snapshot of a system:

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	2	0	0	1	4	2	1	2	3	3	2	1
P_1	3	1	2	1	5	2	5	2				
P_2	2	1	0	3	2	3	1	6				
P_3	1	3	1	2	1	4	2	4				
P_4	1	4	3	2	3	6	6	5				

Answer the following using Banker's algorithm.

i) Is the system in safe state? If so, give the safe sequence.

ii) If process P_2 requests (0, 1, 1, 3) resources can it be granted immediately? **(10 Marks)**

OR

6 a. Explain paging hardware with TLB. **(05 Marks)**

b. Explain segmentation in detail. **(05 Marks)**

c. Discuss structure of page table with suitable diagrams. **(10 Marks)**

Module-4

7 a. Describe the steps in handling page faults. **(06 Marks)**

b. Consider the page reference string: 1, 0, 7, 1, 0, 2, 1, 2, 3, 0, 3, 2, 4, 0, 3, 6, 2, 1 for a memory with 3 frames. Determine the number of page faults using FIFO, optimal and LRU replacement algorithms. Which algorithm is most efficient? **(14 Marks)**

OR

8 a. Explain the different allocation methods. **(10 Marks)**

b. Discuss the various directory structures with required diagrams. **(10 Marks)**

Module-5

9 a. Explain access matrix method of system protection with domain as objects and its implementation. **(10 Marks)**

b. A drive has 5000 cylinders numbered 0 to 4999. The drive is currently serving a request at 143 and previously serviced a request at 125. The queue of pending requests in FIFO order is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from current head position, what is the total distance travelled (in cylinders) by disk arm to satisfy the requests using FCFS, SSTF, SCAN, LOOK and C-LOOK algorithms. **(10 Marks)**

OR

10 a. With a neat diagram, explain the components of a Linux system. **(08 Marks)**

b. Explain the different IPC mechanisms available in Linux. **(06 Marks)**

c. Discuss about scheduling in Linux. **(06 Marks)**

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18CS44

Fourth Semester B.E. Degree Examination, July/August 2022
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. Compare Microprocessors and Microcontrollers. **(06 Marks)**
b. Discuss the ARM design Philosophy. **(06 Marks)**
c. With a neat diagram, explain the four main hardware components of an ARM based embedded device. **(08 Marks)**

OR

2 a. Explain the ARM Core data flow model with a neat diagram. **(08 Marks)**
b. Draw the basic layout of a generic program status register and briefly explain the various fields. **(06 Marks)**
c. What is Pipelining? Illustrate it with a simple example. **(06 Marks)**

Module-2

3 a. Explain the different Data Processing Instructions in ARM. **(10 Marks)**
b. Briefly explain the different Load – Store Instruction categories used with ARM. **(10 Marks)**

OR

4 a. Write a program for forward and backward branch by considering an example. **(06 Marks)**
b. Explain Co – Processor Instructions of ARM processor. **(06 Marks)**
c. Write a note on Profiling and Cycle Counting. **(08 Marks)**

Module-3

5 a. What is an Embedded System? Differentiate between general purpose computing system and embedded system. **(06 Marks)**
b. List any four purposes of Embedded system with examples. **(08 Marks)**
c. Write short notes on : i) Real Time Clock ii) Watch Dog Timer. **(06 Marks)**

OR

6 a. Briefly describe the classification of Embedded system. **(08 Marks)**
b. Explain the following :
i) I 2 C Bus ii) S P I Bus iii) Reset Circuit iv) 1 – Wire Interface. **(12 Marks)**

Module-4

7 a. What are the Operational and Non – Operational Quality Attributes of an Embedded system? **(10 Marks)**
b. Explain the different communication buses used in Automotive applications. **(06 Marks)**
c. Design an FSM model for Tea / Coffee vending machine. **(04 Marks)**

OR

8 a. Explain the Fundamental issues in Hardware Software Co - design. **(06 Marks)**
b. Explain the Assembly language based Embedded firmware development with a diagram. **(06 Marks)**
c. With a neat block diagram, how source file to object file translation takes place in High level language based firmware development. **(08 Marks)**

Module-5

9 a. With a neat diagram, explain Operating System Architecture. **(08 Marks)**
b. Explain Multithreading. **(06 Marks)**
c. Explain the concept of Binary Semaphore. **(06 Marks)**

OR

10 a. Explain the role of Integrated Development Environment (IDE) for Embedded Software development. **(08 Marks)**
b. Write a note on Message passing. **(08 Marks)**
c. Explain the concept of deadlock with a neat diagram. **(04 Marks)**

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18CS45

Fourth Semester B.E. Degree Examination, July/August 2022
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 the concept of object oriented programming language :
(i) Encapsulation
(ii) Polymorphism
(iii) Inheritance **(06 Marks)**

b. What is an inline function? What are the advantages of inline functions? Write a C++ program to find minimum of two numbers using inline function. **(08 Marks)**

c. Define a friend function. Illustrate with an example. **(06 Marks)**

OR

2 a. Why friend functions are required? Write a C++ program to illustrate the use of friend function. **(06 Marks)**

b. What is function overloading? Write a C++ program to swap two integers by function overloading. **(08 Marks)**

c. Explain instance variable hiding. Explain with example how to overcome instance variable hiding. **(06 Marks)**

Module-2

3 a. What are constructors and destructors? Explain default constructors with example. **(08 Marks)**

b. Illustrate with an example the order of calling constructor and destructor. **(08 Marks)**

c. Explain namespaces with example. **(04 Marks)**

OR

4 a. Explain the following : Java buzzwords, Object oriented, Robust, Multi-threaded, Architecture neutral. **(08 Marks)**

b. Write a Java program to find the sum of even numbers using for each version of for loop and print the result. **(06 Marks)**

c. Explain labelled break and labelled continue with examples. **(06 Marks)**

Module-3

5 a. Explain general form of a class with example. **(06 Marks)**

b. Write a Java program to implement stack of integers. Provide constructors and methods to push an element, POP an element and display the contents of the stack. **(14 Marks)**

OR

6 a. Explain multilevel inheritance with an example. **(06 Marks)**

b. Explain exception handling mechanism provided in Java. Give syntax. Write a Java program to demonstrate exception handling construct. **(08 Marks)**

c. Write a Java program to create user defined exception and demonstrate its use. **(06 Marks)**

Module-4

7 a. Explain the steps to create a package in Java with an example. (08 Marks)

b. Explain interfaces in Java with example. (06 Marks)

c. Can interfaces be inherited? Justify with an example. (06 Marks)

OR

8 a. Explain the following methods of Thread class, getName ( ), getPriority ( ), isAlive ( ), join ( ). (08 Marks)

b. Write a Java program to illustrate thread creation using Runnable interface. (06 Marks)

c. Write a Java program to illustrate synchronization using synchronized methods. (06 Marks)

Module-5

9 a. What are events, event listener and event source. Explain delegation event model used to handle events in Java. (07 Marks)

b. Write a Java program to handle mouse dragged and mouse moved events. (07 Marks)

c. Explain Adapter class with example. (06 Marks)

OR

10 a. Explain the following with examples :

(i) JLabel (ii) JTextField (04 Marks)

b. Write a Java program to create a button, on clicking which displays "Welcome to VTU". (06 Marks)

c. Write a Java program to create a table with column heading as FirstName, LastName, Age. Insert at least 3 records in the table and display. (10 Marks)

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CBCS SCHEME

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18CS46

Fourth Semester B.E. Degree Examination, July/August 2022
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. What is Data Communication? With neat diagram, explain the components of data communication. **(08 Marks)**

b. With neat diagram, explain four basic topologies. Assume that 10 devices are connected in mesh topology. How many duplex links are needed? How many ports are needed for each device? **(08 Marks)**

c. Explain Half Duplex and Full Duplex with respect to data communication. **(04 Marks)**

OR

2 a. With neat diagram, explain TCP/IP protocol suite of computer networks. **(08 Marks)**

b. Define transmission impairments. Explain different, causes of transmission impairment during signal transmission. **(08 Marks)**

c. Explain briefly about Shannon capacity and Nyquist bit rate for communication channel. **(04 Marks)**

Module-2

3 a. With neat diagram, explain the most common technique to change analog signal to digital signal. **(12 Marks)**

b. With a neat diagram, explain ASK, FSK and PSK. **(06 Marks)**

c. In a digital transmission the receiver clock is 0.3 percent faster than the sender clock. How many extra bits per second does the receiver receive if the data rate is 1 Mbps? **(02 Marks)**

OR

4 a. Define line coding. List out its characteristics. Represent the sequence "01001110" using NRZ-L, NRZ-I and Manchester scheme. **(10 Marks)**

b. Explain parallel and serial transmission modes. **(06 Marks)**

c. An analog signal has a bit rate of 8000 bps and baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? **(04 Marks)**

Module-3

5 a. What is circuit switching? Enumerate the characteristics of circuit switching. Analyze the three stages of circuit switching. **(10 Marks)**

b. What is multiplexing? Explain wavelength division multiplexing. **(05 Marks)**

c. Given data word 101001111 and devisor 10111. Show the generation of CRC codeword at the sender site. **(05 Marks)**

OR

6 a. What is spread spectrum? Explain FHSS and DHSS. **(10 Marks)**

b. Analyze how message can be transferred from one system to another using datagram network and calculate the delay in the network. **(05 Marks)**

c. Assume a packet is made any of four 16 bits words $(466F)_{16}$, $(726F)_{16}$, $(757A)_{16}$ and $(616E)_{16}$. Find the sender site checksum using traditional checksum algorithm. **(05 Marks)**

Module-4

7 a. With neat diagram, explain point-to-point protocol frame format. **(06 Marks)**
b. Explain pure ALOHA and slotted ALOHA protocols. **(08 Marks)**
c. Explain the working of stop-and-wait protocol for Noiseless channels. **(06 Marks)**

OR

8 a. Analyze channelization. Explain Code Division Multiple Access (CDMA). **(08 Marks)**
b. Mention different controlled access methods. Explain token passing method. **(06 Marks)**
c. Explain class full addressing of IPV4. **(06 Marks)**

Module-5

9 a. Explain the operation of Cellular Telephony. **(08 Marks)**
b. Explain Bluetooth Architecture. **(05 Marks)**
c. Explain the different types of addressing mechanisms in IEEE-802.11. **(07 Marks)**

OR

10 a. With neat diagram, explain Ethernet frame format. **(10 Marks)**
b. Explain access control of wireless LAN. **(05 Marks)**
c. Explain Fourth Generation (4G) of Cellular Telephone. **(05 Marks)**

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