

# CBCS SCHEME

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17MAT41

## Fourth Semester B.E. Degree Examination, Jan./Feb.2021 Engineering Mathematics – IV

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Using Taylor's series method, compute the solution of  $\frac{dy}{dx} = x - y^2$  with  $y(0) = 1$  at  $x = 0.1$ , correct to fourth decimal place. (06 Marks)
- b. Using modified Euler's formula, solve the  $\frac{dy}{dx} = x + \sqrt{y}$  with  $y(0.2) = 1.23$  at  $x = 0.4$  by taking  $h = 0.2$ . (07 Marks)
- c. The following table gives the solution of  $\frac{dy}{dx} = x^2 + \frac{y}{2}$ . Find the value of  $y$  at  $x = 1.4$  by using Milne's Predictor-Corrector method.

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514

(07 Marks)

**OR**

- 2 a. Using modified Euler's method, solve  $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$  with  $y(20) = 5$  at  $x = 20.2$  by taking  $h = 0.2$ . (06 Marks)
- b. Employ the Range-Kutta method of fourth order to solve  $\frac{dy}{dx} = 3x + \frac{y}{2}$ , with  $y(0) = 1$  at  $x = 0.1$  by taking  $h = 0.1$ . (07 Marks)
- c. Using Adams-Bashforth method, find  $y$  when  $x = 1.4$  given  $\frac{dy}{dx} = x^2(1+y)$ , with  $y(1) = 1$ ,  $y(1.1) = 1.233$ ,  $y(1.2) = 1.548$ ,  $y(1.3) = 1.979$  (07 Marks)

### Module-2

- 3 a. Using Runge-Kutta method of fourth order solve the differential equation,  $\frac{d^2y}{dx^2} = x^3\left(y + \frac{dy}{dx}\right)$  for  $x = 0.1$ . Correct to four decimal places with initial conditions  $y(0) = 1$ ,  $y'(0) = 0.5$ . (06 Marks)
- b. Obtain the series solution of Legendre Differential equation leading to  $P_n(x)$ . (07 Marks)
- c. With usual notation, show that  $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ . (07 Marks)

**OR**

- 4 a. Apply Milne's method to compute  $y(1.4)$  given that  $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}$  and

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y'	2	2.3178	2.6725	3.0657

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. State and prove Rodrigue's formula. (07 Marks)  
 c. Express  $f(x) = 3x^3 - x^2 + 5x - 2$  in terms of Legendre's polynomials. (07 Marks)

**Module-3**

- 5 a. State and prove Cauchy-Riemann equations in polar form. (06 Marks)  
 b. If  $V = e^{-2y} \sin 2x$ , find the analytic function  $f(z)$ . (07 Marks)  
 c. Find the bilinear transformation that maps the points  $0, i, \infty$  onto the points  $1, -i, -1$ . (07 Marks)

**OR**

- 6 a. State and prove Cauchy's theorem on complex integration. (06 Marks)  
 b. Evaluate  $\oint_C \frac{z^2 + 5}{(z-2)(z-3)} dz$ , where  $C: |z| = \frac{5}{2}$ . (07 Marks)  
 c. Discuss the transformation  $W = Z + \frac{1}{Z}$ . (07 Marks)

**Module-4**

- 7 a. A box contains 100 transistors, 20 of which are defective and 10 are selected at random, find the probability that (i) all are defective (ii) at least one is defective (iii) all are good (iv) at most three are defective. (06 Marks)  
 b. Show that mean and standard deviation of exponential distribution are equal. (07 Marks)  
 c. The joint probability is,

X \ Y	0	1	2	3
0	0	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	0

- (i) Find marginal distributions of X and Y.  
 (ii) Also find  $E(X)$ ,  $E(Y)$  and  $E(XY)$ . (07 Marks)

**OR**

- 8 a. Find the mean and variance of binomial distribution. (06 Marks)  
 b. In an examination taken by 500 candidates the average and the standard deviation of marks obtained (normally distributed) are 40% and 10%. Find approximately,  
 (i) How many will pass, if 50% is fixed as a minimum?  
 (ii) What should be the minimum if 350 candidates are to pass?  
 (iii) How many have scored marks above 60%? (07 Marks)  
 c. Suppose X and Y are independent random variables with the following distributions:

$x_i$	1	2
$f(x_i)$	0.7	0.3

$y_j$	-2	5	8
$g(y_j)$	0.3	0.5	0.2

Find the joint distribution of X and Y. Also find the expectations of X and Y and covariance of X and Y. (07 Marks)



Module-5

- 9 a. The average income of persons was Rs.210 with a standard deviation of Rs.10 in sample of 100 people of a city. For another sample of 150 persons, the average income was Rs.220 with standard deviation of Rs.12. The standard deviation of the incomes of the people of the city was Rs.11. Test whether there is any significant difference between the average incomes of the localities. (Use  $Z_{0.05} = 1.96$ ) (06 Marks)
- b. 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 = 2.201). (07 Marks)
- c. Define stochastic matrix. Find a unique fixed probability vector for the matrix

$$\begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{6} & \frac{1}{2} & \frac{1}{3} \\ 0 & \frac{2}{3} & \frac{1}{3} \end{bmatrix}$$

(07 Marks)

OR

- 10 a. Explain the following terms:
- Type I and Type II errors.
  - Null hypothesis.
  - Level of significance.
  - Confidence limits.

(06 Marks)

- b. Eleven school boys were given a test in mathematics carrying a maximum of 25 marks. They were given a month's extra coaching and a second test of equal difficulty was held thereafter. The following table gives the marks in two tests.

Boy	1	2	3	4	5	6	7	8	9	10	11
Marks (I test)	23	20	21	18	18	20	18	17	23	16	19
Marks (II test)	24	19	18	20	20	22	20	20	23	20	17

Do the marks give evidence that the students have benefitted by extra coaching? (Given  $t_{0.05} = 2.228$  for 10 d.f) (07 Marks)

- c. Three boys A, B and C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball, find the probabilities that after three throws (i) A has the ball, (ii) B has the ball, (iii) C has the ball. (07 Marks)

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17CS42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021

## Object Oriented Concepts

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- List out the differences between Procedure Oriented Language and Object Oriented Language. (06 Marks)
  - What is friend function in C++? List out the rules to declare the friend function in C++. (06 Marks)
  - What is function overloading? Write a C++ program to define three overloaded functions area() to find area of circle, triangle and rectangle. (08 Marks)

OR

- Explain the various features of OOC. (06 Marks)
  - What is a constructor? Mention its types. Explain copy constructor with suitable code. (08 Marks)
  - What is an inline function? Write a C++ function to find the factorial of a given number using inline function. (06 Marks)

### Module-2

- List and explain the Java Buzzwords. (08 Marks)
  - Why Java Language is Platform Independent Language? Justify your answer. (06 Marks)
  - Write a Java program to find the average and sum of following array elements {4, 8, 12, 16, 20} using foreach in Java. (06 Marks)

OR

- List the different types of operators. Explain any three. (08 Marks)
  - What is an array? Write a Java program to print sum of each row of two dimensional array.

For example :

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

O/p should be

$$\begin{bmatrix} 6 \\ 15 \\ 24 \end{bmatrix}$$

- Explain switch case with an example. (04 Marks)

### Module-3

- What is an exception? Explain exception handling in Java. (10 Marks)
  - What is package in Java? How package is created and imported, explain with an example program (including Execution steps). (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8=50, will be treated as malpractice.



OR

- 6 a. What is an interface? Explain how an interface can be implemented with suitable code. (06 Marks)
- b. What is Inheritance? Differentiate method overloading and method overloading with suitable code. (06 Marks)
- c. Explain any four Built-in exception classes with an example program. (08 Marks)

Module-4

- 7 a. What are threads? Explain two ways of creation of threads with suitable code. (10 Marks)
- b. What is synchronization in Java? Explain synchronization can be implemented with producer-consumer example program. (10 Marks)

OR

- 8 a. What is meant by deadlock? How to avoid deadlock? Give example. (10 Marks)
- b. What is Event handling in Java? Write a Java program to demonstrate Mouse Events handling. (10 Marks)

Module-5

- 9 a. What is an applet? Explain the life cycle of an applet? (10 Marks)
- b. Explain passing parameters in Applets with suitable code. (10 Marks)

OR

- 10 Explain the following with a suitable code:
- (i) JLabel
  - (ii) JTextField
  - (iii) JList
  - (iv) JTable

(20 Marks)

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17CS43

## Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 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

- Define algorithm. Explain asymptotic notations Big oh, Big omega and Big theta with example. (08 Marks)
  - List and explain the important problem types that are solved by computer. (07 Marks)
  - Prove that : If  $t_1(n) \in O(g_1(n))$  and  $t_2(n) \in O(g_2(n))$  then  $t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$ . (05 Marks)

OR

- Design an algorithm for checking whether all elements in a given array are distinct or not. Derive its time complexity. (08 Marks)
  - Give general plan of analyzing recursive algorithm. Mathematically analyze the tower of hanoi problem and find its time efficiency. (08 Marks)
  - Compare the order of growth  $\frac{1}{2}n(n-1)$  and  $n^2$ . (04 Marks)

### Module-2

- Explain divide and conquer method. Write the algorithm for binary search and derive its time complexity. (10 Marks)
  - List out the advantages and disadvantages of divide and conquer method. Illustrate the topological sorting algorithm for the graph in Fig Q3(b), using DFS method.

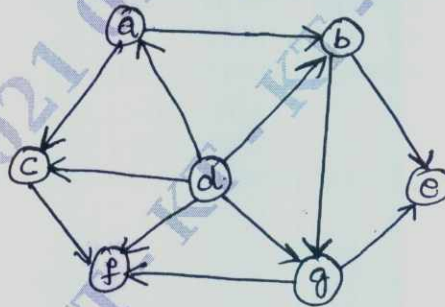


Fig Q3(b)

(10 Marks)

OR

- Apply Quicksort algorithm for the following list of elements 5, 3, 1, 9, 8, 2, 4, 7. (08 Marks)
  - Write algorithm for mergesort and Analyze its efficiency. (08 Marks)
  - Explain Strassen's matrix multiplication. (04 Marks)

**Module-3**

- 5 a. Write Dijkstra's shortest path algorithm. Apply Dijkstra's shortest path algorithm on Fig Q5(a) to obtain shortest path. Assume vertex 6 as source.

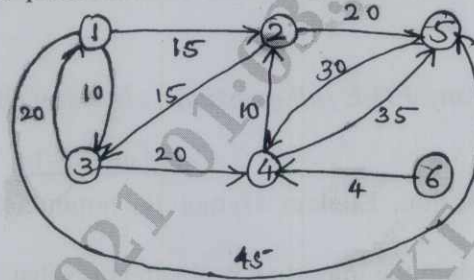


Fig Q5(a)

(10 Marks)

- b. Write an algorithm for the heapsort. Sort the given list of number using heapsort. Derive its time complexity: 100, 75, 80, 25, 50, 30, 45. (10 Marks)

OR

- 6 a. Define minimum spanning tree. Apply Prim's algorithm on the graph Fig Q6(a).

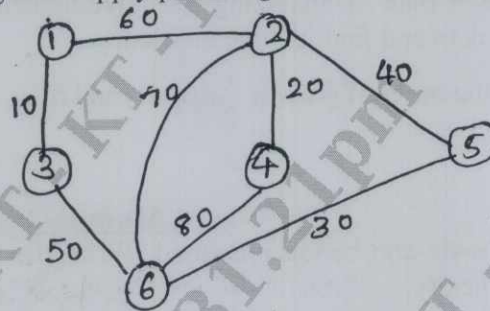


Fig Q6(a)

(08 Marks)

- b. Solve the knapsack problem using greedy method for  $n = 3$ ,  $m = 20$ ,  $(P_1, P_2, P_3) = 25, 24, 15$  and  $(w_1, w_2, w_3) = (18, 15, 10)$ . (04 Marks)
- c. Construct a Huffman code for the following data:

Character	A	B	C	D	-
probability	0.4	0.1	0.2	0.15	0.15

Encode the text ABACABAD and decode the encoded text 100010111001010. (08 Marks)

**Module-4**

- 7 a. Write the pseudocode to find an optimal Binary search tree by dynamic programming. (08 Marks)
- b. Write Bellman Ford algorithm to compute shortest path. (05 Marks)
- c. Find the optimal solution for the following instance of knapsack problem using dynamic programming.

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

(07 Marks)



OR

- 8 a. Explain dynamic programming. Apply Warshalls algorithm to compute transitive closure for the graph in Fig 8(a).

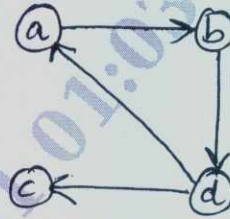


Fig 8(a)

(10 Marks)

- b. Write Floyd's algorithm. Find all pairs shortest path using Floyd's algorithm for the graph in Fig Q8(b).

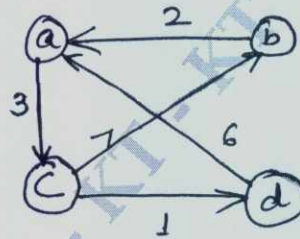


Fig 8(b)

(10 Marks)

**Module-5**

- 9 a. With necessary state space diagram, explain the solving of four-queens problem by backtracking. (10 Marks)  
 b. What is branch and bound technique? How it is different from backtracking? (05 Marks)  
 c. Explain how the Travelling Salesman Problem (TSP) can be solved using branch and bound. (05 Marks)

OR

- 10 a. Apply Backtracking method to solve subset sum problem for the instance  $d = 15$ ,  $s = \{3, 5, 6, 7\}$  (08 Marks)  
 b. Explain the classes of NP-hard and NP-complete. (06 Marks)  
 c. Draw portion of state space tree for m-colouring with  $n = 3$  and  $m = 3$  and explain m-colouring. (06 Marks)

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17CS44

## Fourth Semester B.E. Degree Examination, Jan./Feb.2021 Microprocessor & Microcontroller

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. With a neat diagram, explain the working of a 8086 microprocessor. (10 Marks)
- b. Explain the following 5 addressing modes of 8086 microprocessor:
- (i) Register addressing mode.
  - (ii) Direct addressing mode.
  - (iii) Register indirect addressing mode.
  - (iv) Base relative addressing mode.
  - (v) Based indexed addressing mode.
- with example for each. (10 Marks)

OR

- 2 a. Write an assembly language program to add 5 numbers present in the data segment. (06 Marks)
- b. Explain the following 4 assembler directives of 8086:
- (i) dup
  - (ii) DD
  - (iii) EQU
  - (iv) ORG
- with syntax and examples. (08 Marks)
- c. Explain all bits of a 8086 flag register. (06 Marks)

### Module-2

- 3 a. Explain the interrupt mechanism in 8086 microprocessor. (08 Marks)
- b. Explain use of these instructions with syntax (i) DAA (ii) MUL (iii) ROR (iv) DIV. (08 Marks)
- c. Explain the NMI interrupt. (04 Marks)

OR

- 4 a. Write an ALP to read a string of maximum length of 50 bytes and clear the screen and display the read string at location 12H, 28H on the monitor. (10 Marks)
- b. Explain the following instructions with its syntax:
- (i) CMP
  - (ii) DAS
  - (iii) CALL
  - (iv) XCHG
  - (v) SAR
- (10 Marks)

### Module-3

- 5 a. Interface 4, 32 K RAM to 8086 microprocessor. You may choose the address range of your own. Show the memory map. (10 Marks)
- b. Explain the following string instructions:
- (i) CMPSB
  - (ii) SCASB
  - (iii) LODSB
  - (iv) MOVSB
  - (v) STOSB
- (10 Marks)



OR

- 6 a. Interface 8086 with 8255 chip such that Port A is output port and Port B is input port. Let the addresses be 1100h, 1101h, 1102h, 1103h for Port A, Port B, Port C and control register respectively. Write a program to read from Port B and write it to Port A. (10 Marks)
- b. Explain the following instructions:  
 (i) IDIV (ii) IMVL (iii) CBW (iv) XLAT (10 Marks)

Module-4

- 7 a. Explain RISC design philosophy. (08 Marks)
- b. Explain the instruction set for embedded systems. (06 Marks)
- c. Explain the embedded system hardware. (06 Marks)

OR

- 8 a. Explain the data flow model of a typical ARM core. (08 Marks)
- b. Explain the registers in a ARM microcontroller. (08 Marks)
- c. What is CPSR? Explain. (04 Marks)

Module-5

- 9 a. Explain the role of barrel shifter in ARM processors. (06 Marks)
- b. Explain the following instructions:  
 (i) RSC (ii) SBC (iii) EOR (iv) AND (08 Marks)
- c. Explain the MLA and SMLAL instructions with example. (06 Marks)

OR

- 10 a. Write a program to copy a block of memory to another area in the memory. (10 Marks)
- b. Explain the following instruction with syntax:  
 (i) STMED (ii) SWP (iii) SWI (iv) CMP (10 Marks)

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17CS45

## Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Software Engineering

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 a software process model? Explain briefly different software process models. (10 Marks)  
b. With the help of neat diagram, explain insulin pump control system. (10 Marks)

OR

- 2 a. With a neat diagram, explain Bohem's spiral model. (10 Marks)  
b. List and explain any five software engineering code of ethics. (10 Marks)

### Module-2

- 3 a. Explain Abstraction, Inheritance Polymorphism and Encapsulation with examples. (10 Marks)  
b. Draw context model for an ATM system. (10 Marks)

OR

- 4 a. Describe different types of object oriented modeling. (10 Marks)  
b. Explain Class and objects with suitable examples. (05 Marks)  
c. Write UML notation for class and objects. (05 Marks)

### Module-3

- 5 a. Explain Class diagram, Generalization and Aggregation with examples. (10 Marks)  
b. Describe in short about open source Licensing. (10 Marks)

OR

- 6 a. Explain Use case models with examples. (10 Marks)  
b. Explain Interaction models and behavioral models with examples. (10 Marks)

### Module-4

- 7 a. Define Testing, also explain interface testing with examples. (10 Marks)  
b. Discuss Lehman's laws of program evolution dynamics. (10 Marks)

OR

- 8 a. Discuss four strategic options for legacy system management. (10 Marks)  
b. What is software maintenance? Explain three different types of software maintenance. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



Module-5

- 9 a. What is the purpose of program inspection? Explain different fault classes. (10 Marks)  
b. What is the use of project plan? Describe the different sections of project plan for plan document development. (10 Marks)

OR

- 10 a. What is software pricing? Discuss factors affecting software process. (10 Marks)  
b. Write any four product and process standards. (10 Marks)

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17CS46

## Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 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. Explain Different Forms of Data Representation. (06 Marks)
- b. What is a Network? Explain briefly three important criteria that a network must meet. (06 Marks)
- c. Describe in detail TCP/IP protocol suite. (08 Marks)

OR

- 2 a. Distinguish Simplex, Half Duplex and Full Duplex form of communication. (06 Marks)
- b. What is Line coding? Discuss about NRZ - I and Manchester encoding with example. (06 Marks)
- c. Elucidate on Transmission Impairment. (08 Marks)

### Module-2

- 3 a. What is TDM? Write about inter leaving process in TDM with a schematic. (06 Marks)
- b. Give a brief account on Datagram Network. (06 Marks)
- c. Discuss about Quantization, Quantization levels and Quantization error. Suppose a telephone subscriber line must have an SNR<sub>DB</sub> above 40. What is the minimum number of bits per sample? (08 Marks)

OR

- 4 a. What is Spread Spectrum? Explain FHSS Frequency Selection mapping. (06 Marks)
- b. What is Circuit Switched Network? Mention three phases of circuit switched network. Discuss about Delay and Efficiency in Circuit Switched Networks. (06 Marks)
- c. Discuss about Multiplexing and Demultiplexing process in FDM. Five channels each with a 100KHz Bandwidth are to be multiplexed. What is the minimum bandwidth of the link if there is a need for a guard band of 10KHz between the channels to prevent interference? (08 Marks)

### Module-3

- 5 a. What is Framing? Explain Bit Oriented Protocols. (06 Marks)
- b. What is Forward Error Correction? How Forward error correction is done using Hamming Distance. (06 Marks)
- c. With a outline sketch, describe about stop and wait protocol. Also give the FSM for sending and receiving node. (08 Marks)

OR

- 6 a. Explain different fields of PPP frame. (06 Marks)
- b. What is Checksum? Enumerate the procedures to calculate the traditional checksum. (06 Marks)
- c. What is CRC? How CRC is computed? Compute CRC bits of Data in 1001101 and generator is 1011. (08 Marks)



**Module-4**

- 7 a. What is Channelization? Mention different channelization techniques. Explain FDMA. (06 Marks)
- b. Describe about different implementations of standard Ethernet. (06 Marks)
- c. Give architectural comparison of wired and wireless LANs. Discuss about characteristics of wireless LANs that does not apply to wired LANs. (08 Marks)

OR

- 8 a. Explain CSMA/CD with a flow diagram. (06 Marks)
- b. Explain how hidden station problem of wireless networks is resolved using CSMA/CA? What is the purpose of NAV in CSMA/CA. (06 Marks)
- c. What are the advantages of dividing an Ethernet LAN with a Bridge? What is the relationship between a switch and a bridge? (08 Marks)

**Module-5**

- 9 a. What is Cellular Telephony? Explain Frequency reuse principle in Cellular Telephony. (06 Marks)
- b. Mention three types of IPV6 addresses. Also briefly explain about special addresses. (06 Marks)
- c. Give an elaborate account on GSM Architectures, Features and Working. (08 Marks)

OR

- 10 a. Briefly explain different fields of IP Datagram. In an IPV4 packet the value of HLEN is  $(1000)_2$ . How many bytes of options are being carried by this packet? (06 Marks)
- b. Describe about different transition strategies from IPV4 to IPV6. (06 Marks)
- c. Mention different types Satellites. Explain the working of GPS. (08 Marks)

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17MATDIP41

## Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 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  $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 16 & 8 & -6 & -2 \end{bmatrix}$  by elementary applying row transformation. (06 Marks)
- b. Solve the following system of linear equation by Gauss Elimination method  $x + 2y + z = 3$ ,  $2x + 3y + 3z = 10$ ,  $3x - y + 2z = 13$  (07 Marks)
- c. Find the inverse of the matrix  $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$  using Cayley-Hamilton theorem. (07 Marks)

OR

- 2 a. Reduce the matrix  $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$  into its echelon form and hence find its rank. (06 Marks)
- b. Find the Eigen values and Eigen vectors of the matrix  $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ . (07 Marks)
- c. Solve the following system of linear equation by Gauss Elimination method  $x + y + z = 9$ ,  $x - 2y + 3z = 8$ ,  $2x + y - z = 3$ . (07 Marks)

### Module-2

- 3 a. Solve  $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 6e^{3x}$  (06 Marks)
- b. Solve  $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \cos 3x$  (07 Marks)
- c. Solve  $\frac{d^2y}{dx^2} + y = \tan x$  by the method of variation of parameters. (07 Marks)

OR

- 4 a. Solve  $\frac{d^2y}{dx^2} + 4y = x^2$  (06 Marks)
- b. Solve  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \frac{e^x + e^{-x}}{2}$  (07 Marks)
- c. Solve  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 4e^{3x}$  by the method of undetermined coefficients. (07 Marks)

Module-3

- 5 a. Prove that  $L[\text{Cosh } at] = \frac{s}{s^2 - a^2}$  (06 Marks)
- b. Find the Laplace transform of  $\cos t \cos 2t \cos 3t$  (07 Marks)
- c. Find the Laplace transform of  $f(t) = \begin{cases} t & 0 \leq t \leq a \\ 2a - t & a < t \leq 2a \end{cases}$  where  $f(t + 2a) = f(t)$  (07 Marks)

OR

- 6 a. Find the Laplace transform of  $\sin t \sin 2t \sin 3t$ . (06 Marks)
- b. Find the Laplace transform of  $t^2 \sin at$ . (07 Marks)
- c. Express  $f(t) = \begin{cases} t^2 & 1 < t \leq 2 \\ 4t & t > 2 \end{cases}$  in terms of unit step function and hence find  $L\{f(t)\}$ . (07 Marks)

Module-4

- 7 a. Find the inverse Laplace transform of  $\frac{1}{s(s+1)(s+2)}$  (06 Marks)
- b. Find the inverse Laplace transform of  $\log \frac{(s^2 + 1)}{s(s+1)}$  (07 Marks)
- c. Using Laplace transform, solve  $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 0$  under the initial condition  $y(0) = 1$ ,  $y'(0) = 0$ . (07 Marks)

OR

- 8 a. Find the inverse Laplace transform of  $\log \left( \frac{s+a}{s+b} \right)$ . (06 Marks)
- b. Find the inverse Laplace transform of  $\frac{5s+3}{(s-1)(s^2+2s+5)}$ . (07 Marks)
- c. Solve by using Laplace transform  $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$  under the initial condition  $y(0) = 0$ ,  $y'(0) = 0$ . (07 Marks)

Module-5

- 9 a. Prove that  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ . (06 Marks)
- b. Find the probability that a leap year selected at random will contain 53 Sundays. (07 Marks)
- c. An office has 4 secretaries handling 20%, 60%, 15%, 5% respectively of the files of certain reports. The probabilities that they misfile such reports are respectively 0.05, 0.1, 0.1 and 0.05. Find the probability that a misfiled report is caused by the first secretary. (07 Marks)

OR

- 10 a. State and prove Baye's theorem. (06 Marks)
- b. A problem is given to four students A, B, C, D whose chances of solving it are  $1/2, 1/3, 1/4, 1/5$  respectively. Find the probability that the problem is solved. (07 Marks)
- c. Three machines A, B, C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3%, 4% and 5% respectively. If an item is selected at random. What is the probability that it is defective? If a selected item is defective, what is the probability that it is from machine A? (07 Marks)

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