

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18MAT31

Third Semester B.E. Degree Examination, Jan./Feb. 2021 Transform Calculus, Fourier Series and Numerical Techniques

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 Laplace transform of $\cos t \cos 2t \cos 3t$. (06 Marks)
- b. If $f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$ and $f(t + 2a) - f(t)$, show that $L\{f(t)\} = \frac{1}{s^2} \tan h \left(\frac{as}{2} \right)$. (07 Marks)
- c. Find the Inverse Laplace transforms of :
- i) $\frac{2s+1}{s^2+6s+13}$ ii) $\frac{1}{3} \log \left(\frac{s^2+b^2}{s^2+a^2} \right)$. (07 Marks)

OR

- 2 a. Express the function $f(t)$ in terms of unit step function and find its Laplace transform, where $f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$. (06 Marks)
- b. Find the Inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$ using Convolution theorem. (07 Marks)
- c. Solve by the method of Laplace transforms, the equation $y'' + 4y' + 3y = e^{-t}$ given $y(0) = 0, y'(0) = 0$. (07 Marks)

Module-2

- 3 a. Obtain the Fourier series of the function $f(x) = x^2$ in $-\pi \leq x \leq \pi$. (06 Marks)
- b. Obtain the Fourier series expansion of $f(x) = \begin{cases} x, & 0 < x < \pi \\ x - 2\pi, & \pi < x < 2\pi \end{cases}$. (07 Marks)
- c. Find the Cosine half range series for $f(x) = x(\ell - x), 0 \leq x \leq \ell$. (07 Marks)
- OR
- 4 a. Obtain the Fourier series of $f(x) = |x|$ in $(-\ell, \ell)$. (06 Marks)
- b. Find the sine half range series for $f(x) = \begin{cases} x, & 0 < x < \pi/2 \\ \pi - x, & \pi/2 < x < \pi \end{cases}$. (07 Marks)
- c. Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. (07 Marks)

x	0	1	2	3	4	5
y	9	18	24	28	26	20

1 of 3

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-3

- 5 a. If $f(x) = \begin{cases} 1-x^2, & |x| < 1 \\ 0, & |x| \geq 1 \end{cases}$. Find the Fourier transform of $f(x)$ and hence find value of $\int_0^{\infty} \frac{x \cos x - \sin x}{x^3} dx$. (06 Marks)
- b. Find the Fourier Cosine transform of $f(x) = \begin{cases} 4x, & 0 < x < 1 \\ 4-x, & 1 < x < 4 \\ 0, & x > 4 \end{cases}$. (07 Marks)
- c. Find the Z - transform of $\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$. (07 Marks)

OR

- 6 a. Solve the Integral equation $\int_0^{\infty} f(\theta) \cos \alpha \theta d\theta = \begin{cases} 1-\alpha, & 0 \leq \alpha \leq 1 \\ 0, & \alpha > 1 \end{cases}$ hence evaluate $\int_0^{\infty} \frac{\sin^2 t}{t^2} dt$. (06 Marks)
- b. Find the Inverse Z - transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$. (07 Marks)
- c. Using the Z - transform, solve $Y_{n+2} - 4Y_n = 0$, given $Y_0 = 0, Y_1 = 2$. (07 Marks)

Module-4

- 7 a. Using Taylor's series method, solve the Initial value problem $\frac{dy}{dx} = x^2 y - 1, y(0) = 1$ at the point $x = 0.1$. Consider upto 4th degree term. (06 Marks)
- b. Use modified Euler's method to compute $y(0.1)$, given that $\frac{dy}{dx} = x^2 + y, y(0) = 1$ by taking $h = 0.05$. Consider two approximations in each step. (07 Marks)
- c. Given that $\frac{dy}{dx} = x - y^2$, find y at $x = 0.8$ with

x :	0	0.2	0.4	0.6
y :	0	0.02	0.0795	0.1762

By applying Milne's method. Apply corrector formula once. (07 Marks)

OR

- 8 a. Solve the following by Modified Euler's method $\frac{dy}{dx} = x + \sqrt{y}, y(0) = 1$ at $x = 0.4$ by taking $h = 0.2$. Consider two modifications in each step. (06 Marks)
- b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$. Compute $y(0.2)$ by taking $h = 0.2$ using Runge - Kutta method of order IV. (07 Marks)
- c. Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979$, determine $y(1.4)$ by Adam's Bashforth method. Apply corrector formula once. (07 Marks)

Module-5

- 9 a. Given $y'' - xy' - y = 0$ with $y(0) = 1$, $y'(0) = 0$. Compute $y(0.2)$ using Runge – Kutta method. (06 Marks)
- b. Derive Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y'} \right) = 0$. (07 Marks)
- c. Prove that the geodesics on a plane are straight lines. (07 Marks)

OR

- 10 a. Find the curve on which functional $\int_0^1 [(y')^2 + 12xy] dx$ with $y(0) = 0$, $y(1) = 1$ can be extremized. (06 Marks)
- b. Obtain the solution of the equation $\frac{2d^2y}{dx^2} = 4x + \frac{dy}{dx}$ by computing the value of dependent variable corresponding to the value 1.4 of the independent variable by applying Milne's method using the following data. Apply corrector formula once. (07 Marks)

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

- c. A heavy cable hangs freely under gravity between two fixed points. Show that the shape of the cable is Catenary $y = c \cosh \left(\frac{x+a}{c} \right)$. (07 Marks)

* * * * *

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CS32

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

Data Structures and Applications

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 structures. Explain with neat block schematic different types of data structures with examples. What are the primitive operations that can be performed? (10 Marks)
- b. Define sparse matrix. Express the following matrix in triplet form and find its transpose. (10 Marks)

$$A = \begin{bmatrix} 15 & 0 & 0 & 22 \\ 0 & 11 & 3 & 0 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 \end{bmatrix}$$

OR

- 2 a. Explain any four dynamic memory allocation functions with syntax and example. (10 Marks)
- b. What do you mean by pattern matching? Outline the KMP algorithm. Implement the same to find out the occurrence of following pattern.
P: ABCDABD
S: ABC ABCDAB ABCDABCDABDE (10 Marks)

Module-2

- 3 a. Define Recursion. Let A and B be nonnegative integers. Suppose a function GCD is recursively defined on follows:
 $GCD(A, B) = GCD(B, A)$ if $A < B$
 $= A$ if $B = 0$
 $= GCD(B, MOD(A, B))$ otherwise
Here MOD(A, B) read as A Modulo B. Evaluate GCD(20, 28). (04 Marks)
- b. Write C function for push(), pop() and display() routine of STACK. (08 Marks)
- c. Outline the algorithm for infix to postfix. Using the same algorithm convert following INFIX expression to equivalent POSTFIX.
 $((H * (((A + ((B + C) * D)) * F) * G) * E)) + J$ (08 Marks)

OR

- 4 a. Write a C function CQInsert() and CQDelete() operations on circular queue. (08 Marks)
- b. Outline the algorithm for infix to prefix. Using the same algorithm convert following INFIX to equivalent PREFIX.
 $((H * (((A + ((B + C) * D)) * F) * G) * E)) + J$ (08 Marks)
- c. Evaluate the following postfix expression by showing the contents of the stack.
 $5\ 4\ 6\ +\ * \ 4\ 9\ 3\ / \ + \ *$ (04 Marks)

Module-3

5 a. Write C functions for the following operations on linked list:

- i) Insertion at the beginning
- ii) Insertion at the end
- iii) Deletion at the beginning
- iv) Deletion at the end.

(12 Marks)

b. Explain concept of sparse matrix representation using linked list. Represent the following sparse matrix in linked list format. (08 Marks)

$$A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$$

OR

6 a. Write C function to add two polynomials. Show the linked list representation of below two polynomials and in addition.

$$\text{POLY 1: } 5x^2 + 4x + 2$$

$$\text{POLY 2: } 3x^2 + 2x + 5$$

(08 Marks)

b. Write C functions for following operations on circular linked list:

- i) Insertion at the beginning
- ii) Insertion at the end
- iii) Deletion at the beginning
- iv) Deletion at the end.

(12 Marks)

Module-4

7 a. Define Binary tree with an example. Write C recursive routine to traverse the given tree using inorder, preorder and postorder. (08 Marks)

b. Define binary search tree. Draw the BST for the following input:

14 15 4 9 7 18 3 5 16 20 17 9

Give recursive search function to search an element in that tree. (06 Marks)

c. Given the following traversal, draw a binary tree:

i) Inorder : 4 2 5 1 6 7 3 8

Postorder : 4 5 2 6 7 8 3 1

ii) Preorder : A B C E I F J D G H K L

Inorder : E I C F J B G D K H L A

(06 Marks)

OR

8 a. Represent the below given tree in Fig.Q.8(a), using

- i) Linked list representation
- ii) Left child right sibling representation.

(08 Marks)

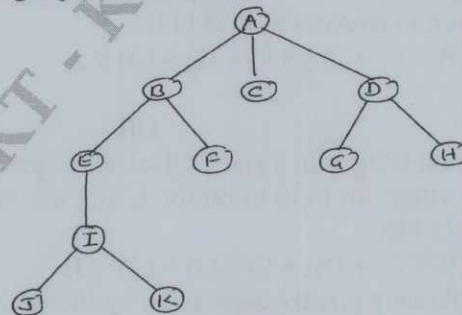


Fig.Q.8(a)

- b. Define threaded binary tree. List its advantages and disadvantages. Draw the one way threading and two way threading of the following binary tree. (Refer Fig.Q.8(b)). (08 Marks)

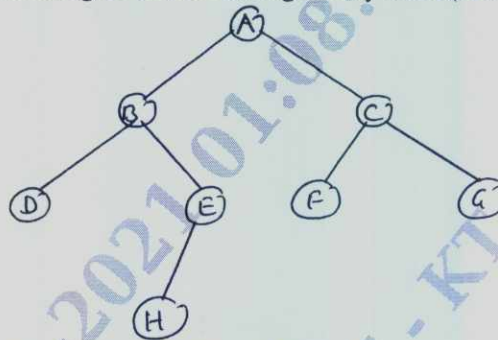


Fig.Q.8(b)

- c. Write function to insert an element in a binary search tree. (04 Marks)

Module-5

- 9 a. Define the following terminologies with examples:
 i) Digraph ii) Weighted graph iii) Self loop iv) Parallel edges (08 Marks)
 b. Give the adjacency matrix, incidence matrix and linked list representation of the following undirected graph. (06 Marks)

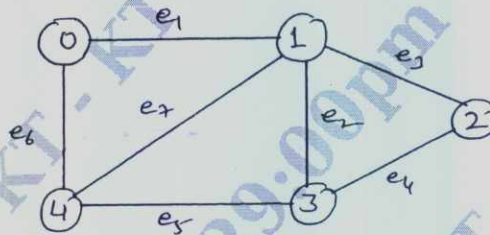


Fig.Q.9(b)

- c. Arrange the following elements in ascending order using RADIX SORT
 151, 60, 875, 342, 12, 477, 689, 128, 15 (06 Marks)

OR

- 10 a. Explain different types of HASH function with example. (10 Marks)
 b. Explain any five file operations along with syntax and example. (10 Marks)

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CS33

Third Semester B.E. Degree Examination, Jan./Feb. 2021 Analog and Digital Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Explain the working principle of opto coupler with neat diagram. (06 Marks)
 - Derive an expression for collector current and collector emitter voltage of fixed bias circuit. (06 Marks)
 - For the circuit shown in Fig.Q.1(c), draw DC load line, use silicon transistor with $B = 50$, $V_{BE} = 0.7V$. (08 Marks)

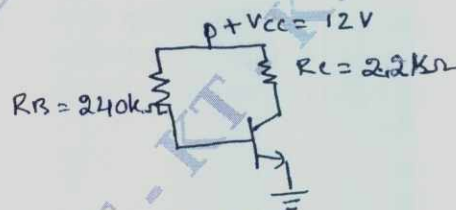


Fig.Q.1(c)

OR

- With the help of neat circuit diagram and wave form explain the working principle of relaxation oscillator. (10 Marks)
 - Explain current to voltage converter. (05 Marks)
 - Define voltage regulator. Explain adjustable voltage regulator. (05 Marks)

Module-2

- Simplify the following function using K-map and obtain simplified Boolean expressions.
 - $f_1(a, b, c, d) = \sum m(1, 3, 4, 5, 7, 10, 12)$
 - $f_2(a, b, c, d) = \sum m(5, 8, 9, 10, 11, 12, 13, 14, 15)$ (10 Marks)
 - Find all the prime implicants of function using Q-M method.
 $f(a, b, c, d) = \sum m(0, 2, 3, 4, 8, 10, 12, 13, 14)$ (10 Marks)

OR

- For the following function given use Q-M method and obtain simplified expression:
 $f(a, b, c, d) = \sum m(7, 9, 12, 13, 14, 15) + dc(4, 11)$ (08 Marks)
 - With an example explain Petrik's method. (06 Marks)
 - For the given function determine minimal sum using MEV technique. Use d as MEV variable. $f(a, b, c, d) = \sum m(3, 4, 5, 7, 8, 11, 12, 13, 15)$. (06 Marks)

Module-3

- Define static 1 – hazard. Explain how static 1-hazard can be detected and removed with an example. (08 Marks)
 - What is multiplexer and explain 8 to 1 mux with the help of logic diagram and corresponding expression. (06 Marks)
 - Explain the importance of three-state buffer. (06 Marks)

OR

- 6 a. Implement the following functions using 3:8 decoder
 $f_1(a, b, c) = \sum m(0, 4, 6, 7)$ (06 Marks)
 $f_2(a, b, c) = \sum m(1, 4, 5)$
 b. Implement the following Boolean functions using an appropriate PLA:
 $f_1(a, b, c) = \sum m(0, 4, 7)$ (06 Marks)
 $f_2(a, b, c) = \sum m(4, 6)$ (08 Marks)
 c. Realize a full adder using PAL.

Module-4

- 7 a. Explain the structure of VHDL program. Write VHDL code for 4-bit parallel adder using full adder as component. (08 Marks)
 b. With necessary diagrams, Explain switch debouncing with an S-R latch. (06 Marks)
 c. Explain D flip-flop with the help of timing diagram. (06 Marks)

OR

- 8 a. Give the implementation of T-flip-flop from D flip-flop. (04 Marks)
 b. Explain master-slave J-K flip-flop operation. (08 Marks)
 c. Derive the characteristic equations for the following flip-flops:
 i) S-R flip-flop
 ii) D-flip flop
 iii) T-flip-flop
 iv) J-K flip-flop. (08 Marks)

Module-5

- 9 a. With neat sketch, explain the working principle of Serial Input Serial Output (SISO) shift register. (06 Marks)
 b. Design 3 bit synchronous binary counter using transition table of T-flip-flop (08 Marks)
 c. Explain how 4 bit register with data, load, clear and clock input is constructed using D-flip-flops. (06 Marks)

OR

- 10 a. With the help of state graph, state and transition table and timing diagram, explain sequential parity checker. (06 Marks)
 b. With the help of block diagram, explain the working principle of n-bit parallel adder with accumulator. (08 Marks)
 c. Analyze following Moore sequential circuit for an input sequence $X = 01101$ and draw the timing diagram. (06 Marks)

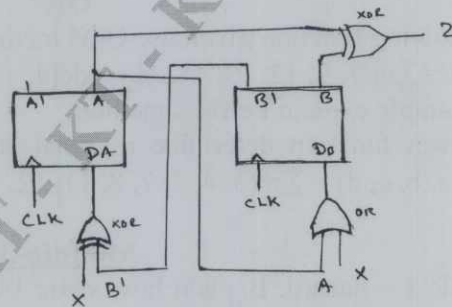


Fig.Q.10(c)

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CS34

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

Computer organization

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. How to measure the performance of a computer? Explain. (08 Marks)
b. Define addressing modes. Explain any five types of addressing modes with example. (12 Marks)

OR

- 2 a. Define subroutine and parameter passing. Explain how to pass the parameter by value and by reference. (10 Marks)
b. How the input and output operations are to be performed by the processor? Write a program that reads a line of characters and displays it. (10 Marks)

Module-2

- 3 a. Write the scenario when the interrupts are enabled. (06 Marks)
b. Explain how the I/O devices should be organized in a priority structure. (08 Marks)
c. Define exception, describe the different kinds of exceptions. (06 Marks)

OR

- 4 a. Define bus arbitration. Explain the two approaches to bus arbitration. (10 Marks)
b. With the help of timing diagram, explain the read operation on the PCI bus. (10 Marks)

Module-3

- 5 a. Explain the operation of a CMOS memory cell. (06 Marks)
b. With a neat figure, explain the organization of a $2M \times 32$ memory module using $512K \times 8$ static memory chips. (08 Marks)
c. Explain the internal structure of synchronous DRAM. (06 Marks)

OR

- 6 a. What is the use of a cache memory? Explain in detail the three types of determining the cache locations to store memory blocks. (10 Marks)
b. How the parallelism is to be used as on interleaving? Explain. (10 Marks)

Module-4

- 7 a. A half adder is a combinational logic circuit that has two inputs x and y and two outputs sum(s) and carry(c), resulting from the binary addition of x and y .
i) Design a half adder as a two-level AND-OR circuit.
ii) Show how to implement a full-adder using two half address and external logic gates, as necessary. (10 Marks)
b. Given, multiplicand $A = +23$ and multiplier $B = -10$. Perform the multiplication of A and B using Booth's algorithm. (10 Marks)

OR

- 8 a. Explain 4-bit carry-look ahead adder. (10 Marks)
b. Perform the division of $8 \div 3$ using restoring division. (10 Marks)

Module-5

- 9 a. Write and explain the control sequence for execution of the instruction Add(R3), R1. (10 Marks)
b. Explain the three-bus organization of the data path. (10 Marks)

OR

- 10 a. Explain in detail the organization of control unit. (10 Marks)
b. Explain the operation of 4-stage pipeline. (10 Marks)

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CS35

Third 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 are the attributes of good software? Explain the key challenges faced in software engineering. (08 Marks)
- b. With a neat diagram, explain the waterfall model of software development process. (06 Marks)
- c. Describe the general model of software design process. (06 Marks)

OR

- 2 a. Define and differentiate functional and non-functional requirements. (06 Marks)
- b. What is requirements specification? Explain various ways of writing system requirements. (08 Marks)
- c. What is ethnography? How ethnography is effective in discovering the types of requirements? (06 Marks)

Module-2

- 3 a. What is OO development? Explain object oriented themes briefly. (08 Marks)
- b. What are links and associations? Write and explain UML notation for links and association with an example. (06 Marks)
- c. Describe generalization and inheritance with an example. (06 Marks)

OR

- 4 a. What is object orientation? What are the important characteristics of OO approach? Explain. (08 Marks)
- b. Define model. Describe the relationship among three models. (08 Marks)
- c. With the help of a sample class model explain multiplicity and Association and names. (04 Marks)

Module-3

- 5 a. Draw and explain a contest model for patient information system. (06 Marks)
- b. With a diagram, explain the phases in the Rational Unified Process (RUP). (06 Marks)
- c. With the help of a neat state diagram, illustrate the working of a microwave oven. (08 Marks)

OR

- 6 a. What is model driven engineering? State the three types of abstract system model produced with a neat diagram. (08 Marks)
- b. What are the activities to be carried out in object oriented design process of a system? How the objects are identified? (08 Marks)
- c. What is open source development? Explain general models of open source licensing. (04 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-4

- 7 a. What is list driven development? With a neat diagram, explain test driven development process. (08 Marks)
- b. With neat diagram, explain six stages of acceptance testing process. (08 Marks)
- c. What are the different types of interfaces to be tested during component testing? Explain. (04 Marks)

OR

- 8 a. Write and explain Lehman's laws related to system change. (08 Marks)
- b. What is software maintenance? Draw the general model of reengineering process and explain. (08 Marks)
- c. What are the strategic options involved in legacy system management? Discuss. (04 Marks)

Module-5

- 9 a. For the set of tasks shown below draw the activity bar chart for the project scheduling.

Task	Duration (Days)	Dependencies
T ₁	10	-
T ₂	15	
T ₃	15	T ₁ (M1)
T ₄	10	-
T ₅	10	T ₂ , T ₄ (M3)
T ₆	5	T ₁ , T ₂ (M4)
T ₇	20	T ₁ (M1)
T ₈	25	T ₄ (M2)
T ₉	15	T ₃ , T ₆ (M5)
T ₁₀	15	T ₇ , T ₈ (M6)
T ₁₁	10	T ₉ (M7)
T ₁₂	10	T ₁₀ , T ₁₁ (M8)

- b. Write and explain the factors affecting software pricing. (08 Marks)
- c. Explain briefly the algorithm cost modeling and write the difficulties. (05 Marks)

- 10 a. With a diagram, explain the phase involved in software review process. (07 Marks)
- b. Explain briefly the key stages in the process of product measurement. (08 Marks)
- c. Write any four product and process standards. (04 Marks)

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CS36

Third Semester B.E. Degree Examination, Jan./Feb. 2021 Discrete Mathematical Structures

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Verify that, for any three propositions p, q, r the compound proposition $[p \rightarrow (q \rightarrow r)] \rightarrow [(p \rightarrow q) \rightarrow (p \rightarrow r)]$ is a tautology or not. (06 Marks)
- b. Test for validity of following argument.
If Ravi goes out with friends, he will not study
If Ravi do not study, his father becomes angry
His father is not angry
 \therefore Ravi has not gone out with friends (07 Marks)
- c. Give direct and indirect proof of following statement "Product of two odd integers is an odd integer". (07 Marks)

OR

- 2 a. For any three propositions p, q, r , prove that $[\sim p \wedge (\neg q \wedge r)] \vee [(q \wedge r) \vee (p \wedge r)] \Leftrightarrow r$ (06 Marks)
- b. Check for validity of following argument,
If a triangle has two equal sides then it is isosceles. If a triangle is isosceles then it has two equal angles.
A certain triangle ABC does not have two equal angles
 \therefore The triangle ABC does not have two usual sides (07 Marks)
- c. Consider the following open statement on set of all real numbers as universe:
 $p(x) : x \geq 0$ $q(x) : x^2 \geq 0$ $r(x) : x^2 - 3x - 4 = 0$ $s(x) : x^2 - 3 > 0$
Then find truth value of i) $\exists x p(x) \wedge q(x)$ ii) $\forall x, p(x) \rightarrow q(x)$ iii) $\forall x, q(x) \rightarrow s(x)$
iv) $\forall x, r(x) \vee s(x)$ (07 Marks)

Module-2

- 3 a. By mathematical induction prove that
 $1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{1}{2} n(2n-1)(2n+1)$ (06 Marks)
- b. Find coefficient of i) x^0 in the expansion of $\left(3x^2 - \frac{2}{x}\right)^{15}$
ii) $x^{11} y^4$ in the expansion of $(2x^3 - 3xy^2 + z^2)^6$ (07 Marks)
- c. A total amount of Rs.1500 is to be distributed to three students A, B, C. In how many ways distribution can be done in the multiples of Rs.100 if
i) Every students sets at least Rs.300
ii) A must get at least Rs.500, B and C must set at least Rs.400 each. (07 Marks)

OR

- 4 a. By mathematical induction prove that for any positive integer n the number $11^{n+2} + 12^{2n+1}$ is divisible by 133 (06 Marks)
- b. How many positive integers n can be formed from the digits 3, 4, 4, 5, 5, 6, 7 if we want n to exceed 5,000,000. (07 Marks)
- c. A certain question paper has 3 parts A, B, C with four questions in Part A, Five in B and Six in C. It is required to answer seven questions by selecting at least two from each part. In how many different ways student can answer seven questions. (07 Marks)

Module-3

- 5 a. Let $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{6, 7, 8, 9, 10\}$ and f be a function from A to B defined by $f = \{(1, 7) (2, 7), (3, 8) (4, 6) (5, 9) (6, 9)\}$. Then find $f^{-1}(6)$, $f^{-1}(9)$. If $B_1 = \{7, 8\}$, $B_2 = \{8, 9, 10\}$ find $f^{-1}(B_1)$, $f^{-1}(B_2)$. (06 Marks)
- b. Let $A = \{1, 2, 3, 4\}$ and R be a relation on A defined by xRy if and only if x divides y . Then
i) Write R as ordered pairs ii) Draw diagram iii) Write matrix of R . (07 Marks)
- c. If f, g, h are functions from R to R defined by $f(x) = x^2$, $g(x) = x + 5$, $h(x) = \sqrt{x^2 + 2}$. Then verify that $f \circ (g \circ h) = (f \circ g) \circ h$ (07 Marks)

OR

- 6 a. If 30 dictionaries in a library contain total 61,327 pages then prove that at least one of the dictionaries must have at least 2045 pages. (06 Marks)
- b. For any three nonempty sets A, B, C prove that
i) $(A \cup B) \times C = (A \times C) \cup (B \times C)$
ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$ (07 Marks)
- c. Let $A = \{1, 2, 3, 4, 6, 8, 12\}$ define a partial order R on A by xRy if and only if x divides y . Draw Hasse diagram of R . (07 Marks)

Module-4

- 7 a. For the integers $1, 2, \dots, n$, there are 11660 derangements where $1, 2, 3, 4, 5$ appear in first five positions then find value of n . (06 Marks)
- b. Determine number of integers between 1 and 300 which are i) divisible by exactly two of $5, 6, 8$ ii) at least two of $5, 6, 8$. (07 Marks)
- c. Solve $a_n = 2(a_{n-1} - a_{n-2})$ for $n \geq 2$ given $a_6 = 1, a_1 = 2$ (07 Marks)

OR

- 8 a. Out of 30 students of a hostel 15 study history, 8 study economics, 6 study geography and 3 study all the three subjects. Show that 7 or more study none of the subjects. (06 Marks)
- b. An apple, a banana, a mango, and an orange to be distributed to 4 boys B_1, B_2, B_3 and B_4 . The boys B_1 and B_2 do not wish apple, B_3 does not want banana or mango B_4 refuses orange. In how many ways distribution can be made so that all of them are happy. (07 Marks)
- c. Solve $a_n - 3a_{n-1} = 5 \times 3^n$ for $n \geq 1$ given $a_0 = 2$. (07 Marks)

Module-5

- 9 a. Show that following graphs in the Fig.Q.9(a)(i) and Fig.Q.9(a)(ii) are isomorphic

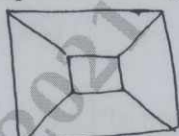


Fig.Q.9(a)(i)

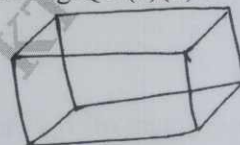


Fig.Q.9(a)(ii)

- b. Define with an example to each i) Complement of a graph ii) Vertex degree (06 Marks)
- iii) Rooted tree iv) Prefix code (07 Marks)
- c. Apply merge sort to the list $-1, 7, 4, 11, 5, -8, 15, -3, -2, 6, 10, 3$ (07 Marks)

OR

- 10 a. Prove that a tree with n vertices has $(n - 1)$ edges. (06 Marks)
- b. Determine number of vertices in following graph G :
i) G has 9 edges and all vertices have degree 3
ii) G has 10 edges with 2 vertices of degree 4 and all other have degree 3 (07 Marks)
- c. Obtain optimal prefix code for the message ROAD IS GOOD. (07 Marks)

CBCS SCHEME

18CPC39/49

USN

--	--	--	--	--	--	--	--	--	--

Question Paper Version : A

Third/Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Constitution of India, Professional Ethics and Cyber Law
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. The fundamental rights guaranteed by the Constitution of India to its citizens can be protected by
a) Parliament
b) President
c) Supreme court
d) Union Home Minister
 2. Which is the key to open the minds of the makers of the constitution?
a) Preamble
b) Parliament
c) Judiciary
d) Part – III (FRS)
 3. Who was the Chairman and Chief Architect of the Indian Constitution?
a) Jawaharlal Nehru
b) Mahatma Gandhi
c) Dr. B.R. Ambedkar
d) Mount Batten
 4. Which is the basis or test for the classification of people under Art.14?
a) Caste
b) Intelligible quotient
c) Intelligible differentia
d) Annual income
 5. The Parliamentary system of Government of India is based on the pattern of
a) USA
b) UK
c) USSR
d) China
 6. Which of the following is not a fundamental right?
a) Right to trade
b) Right to property
c) Right to life
d) Right to form an association or union
 7. The directive principles of state policy are
a) Enforceable by court
b) Not enforceable by court
c) Absolute principles
d) None of these

8. The practice of untouchability is prohibited under
 a) Art.14 b) Art.15 c) Art.16 d) Art.17
9. Which of the ground replaced the internal disturbance by amendment in the year 1977?
 a) War b) External aggression
 c) Armed rebellion d) Terrorist activities
10. Which article has amended recently to remove the special status to the state of Jammu and Kashmir?
 a) Art. 368 b) Art. 370 c) Art. 372 d) Art. 380
11. How many members are there in the election commission including its chairman?
 a) 5 b) 4 c) 3 d) 2
12. Who is empowered to proclaim the state emergency?
 a) Union President b) Parliament c) Governor of a state d) Prime Minister
13. Who is having the power to amend the provisions of the Constitution under Article 368?
 a) Parliament b) President c) Union cabinet d) Supreme court
14. How many members are nominated to Rajyasabha by the President of India?
 a) Two b) 20 c) 12 d) One
15. High Court Judge retires at the age of
 a) 65 years b) 58 years c) 60 years d) 62 years
16. Who can appoint the Chief Justice of Supreme court of India?
 a) Prime Minister b) Law Minister c) President d) Attorney-General
17. Money Bill will be introduced only in
 a) Cabinet b) Loka Sabha c) Rajya Sabha d) Any one of these
18. "Equal Pay for Equal Work" for the men and women is included under
 a) Part-II Citizenship b) Part-III : Fundamental Rights
 c) Part-IV DPSP d) Part-V-A : Fundamental Duties
19. The right to freedom of press and publication are included in
 a) Right to personal liberty b) Right to speech and expression
 c) Right to move anywhere in India d) Right to trade
20. By which amendment, right to education made fundamental right and a new provision, Art.21-A was included in the constitution?
 a) 44th Amendment b) 76th Amendment c) 86th Amendment d) 91st Amendment
21. The term of the selection commissioner is
 a) 3 years
 b) 4 years
 c) 6 years or till he attains the age of 65 years
 d) 5 years or till he attains the age of 62 years
22. Which one is not a kind of trade mark?
 a) Designs b) Symbols c) Sounds d) Goodwill

23. Which is the very essential element in professional ethics?
 a) Honesty b) Responsibility c) Risk d) Over-confidence
24. Who is the ex-officio-chairman of Rajya Sabha?
 a) President b) Vice-President c) Prime Minister d) None of these
25. Which one of the following is not a fundamental right under Art. 21?
 a) Right to life b) Right to dignity c) Right to privacy d) Right to suicide
26. If the Head of the State is an elected functionary for a fixed term, it is known as
 a) Unitary b) Federal c) Republic d) Democratic
27. Which schedule gives details regarding the subjects included in the three lists – Central, State and Concurrent?
 a) Schedule - VII b) Schedule - VIII c) Schedule - V d) Schedule - IV
28. 'Sovereign' means
 a) Independent Supreme Authority b) Absolutism
 c) Dependent Authority d) Dictatorship
29. A person can move to the Supreme Court directly for any violation of his Fundamental Right under Article
 a) 12 b) 22 c) 32 d) 226
30. Which one of the following is not included under the definition of state in Art.12?
 a) Parliament b) Corporations c) Executive d) Judiciary
31. Indian Constitution is silent on the concept of
 a) Deputy Speaker of Loka Sabha b) Deputy Prime Minister
 c) Deputy Chief Minister d) Both (b) and (c)
32. Who is the Presiding Officer of the joint-session to discuss on the controversial bill of the parliament?
 a) President b) Vice-President
 c) Speaker of Loka Sabha d) Prime Minister
33. Who has the power to pardon the death sentence?
 a) President b) Chief Justice of Supreme Court
 c) Governor of a State d) Both (b) and (c)
34. Who can disqualify the MLAs, if they act against anti-defection law?
 a) Speaker of Loka Sabha b) Speaker of Legislative Assembly
 c) Prime Minister d) Chief Minister of a State
35. What is the term of member of Rajya Sabha?
 a) 5 years b) 6 years c) 4 years d) 2 years
36. Which bill is to be introduced only in Loka Sabha?
 a) Ordinary bill b) Money bill c) Amendment bill d) None of these
37. The protection, "No person is to be forced or compelled to say the witness against himself" is
 a) Ex-Post Facto Law b) Double Zeo Pardy
 c) Self-Incrimination d) Testimonial Compulsion

38. Phishing is
 a) a cyber crime b) civil wrong c) a net work d) a type of computer
39. Child Pornography is
 a) Exposure of social behaviour of children
 b) Exploitation of children in the porn industry
 c) Not a cyber crime
 d) appreciable one
40. Which is the India's cybercrime capital?
 a) Bombay b) Delhi c) Bengaluru d) Calcutta
41. Federal type of Government means
 a) Division of powers between Centre and State
 b) Distribution of powers between legislature and executive
 c) Separation of powers between President and Prime Minister
 d) None of the above
42. How much time taken to draft the Indian Constitution to adopt?
 a) 03 years 10 months 07 days b) 05 years 11 months 19 days
 c) 04 years 11 months 17 days d) 02 years 11 months 18 days
43. The seat of Supreme Court is in
 a) Bangaluru b) Delhi c) Mumbai d) Chennai
44. Which article recognized the international law under constitution?
 a) Art. 32 b) Art. 42 c) Art. 50 d) Art. 51
45. Writ of 'Habeaus Corpus' means
 a) To command to do a duty b) To quash the decision
 c) To produce the person before the court d) On what authority?
46. The right to public appointment has been provided in
 a) Art. 14 b) Art. 15 c) Art. 16 d) Art. 20
47. Reasonable restrictions can be imposed by the state under the provision of
 a) Art. 19(1)(a) to (g) b) Art. 19 (2) to (6)
 c) Art. 20 (a) to (c) d) Art. 21
48. An arrested person is to be allowed to
 a) Choose his own advocate b) Contact the political people
 c) Contact nearest magistrate d) Contact his relative
49. Any law made by the Parliament in contravention to the fundamental rights is declared as.....
 a) Valid b) Illegal c) Void d) Incorrect
50. Who are not entitled to form a Union or Association?
 a) Police b) Students
 c) Teachers d) Workmen of an industry
51. The punishment for identity theft (making use of the electronic signature or password fraudulently) in India is
 a) 6 years b) 3 years c) 10 years d) 3 months

52. What is serious crime in Cyber Law which attracts a prison sentence for 20 years or more?
 a) Fraud b) Child pornography c) Software Piracy d) Hacking
53. One of the ways of misusing the truth is
 a) Making the confused statement b) Falsihood
 c) Deliberate deception d) Misrepresentation
54. One of the aims of engineering ethics is to
 a) Acquire new skills in engineering
 b) Stimulate to conduct research
 c) Stimulate the moral imagination
 d) Train to acquire self-confidence in their duties
55. Which of the provisions cannot be suspended during national emergency?
 a) Arts. 14 and 15 b) Arts. 23 and 24 c) Arts. 20 and 21 d) Arts. 17 and 18
56. The constitution expressly permits the state to make special provisions for
 a) Women and unemployed persons
 b) Socially and educationally backward class people
 c) Old, sick and disabled persons
 d) Senior citizens
57. 'Creamy layer' means
 a) Highly educated persons b) Illiterate persons
 c) Highly cultured persons d) Persons having higher incomes
58. Under fundamental rights, Minority may be considered on the basis of
 a) Linguistic or religious b) Regional or national
 c) Racial or regional d) Caste or racial
59. The right against exploitation prohibits
 a) Labourers b) Mining employees sufferings
 c) Traffic in human beings d) None of these
60. The Supreme Court can issue the appropriate writ when there is a violation of
 a) Fundamental right b) Fundamental duties
 c) Directive principles d) None of these
61. Which writ can be issued to quash the decision of lower courts?
 a) Habeas corpus b) Mandamus c) Prohibition d) Certiorari
62. The rights of citizens to take out processions or meeting is conferred by
 a) Right to form an association b) Right to move anywhere in India
 c) Right to assembly d) Right to carry on any trade
63. Which of the following word was added to the preamble of the constitution by the 42nd Amendment Act, 1976?
 a) Secular b) Republic c) Sovereign d) Democratic
64. Who can appoint the Chief Justice and other Judges of the Supreme Court?
 a) Prime Minister b) President c) Law Minister d) Vice-President
65. The doctrine of 'Rule of Law' is profounded by
 a) Dr. A.V. Dicey b) Dr. B.R. Ambedkar c) Kelson d) Bentham

66. What is the source of law in India?
a) Common law principles
b) Constitution of India
c) Supreme Court of India
d) Union Legislature (Parliament)
67. Who can be removed by the process of "impeachment"?
a) Prime Minister
b) Governor
c) District Judge
d) President
68. What is the basic attitude towards responsibility of engineer?
a) Absolute responsibility
b) Reasonable care
c) Personal safety
d) Strict guidelines
69. Which fund is utilized to meet the unforeseen expenditure?
a) Contingency Fund of India
b) Consolidated Fund of India
c) Public Revenue Fund
d) Political Party Fund
70. Attorney-General of India is appointed by
a) Prime Minister
b) Law Minister
c) President
d) Chief Justice of Supreme Court
71. Who can certify the money bill immediately when it is introduced in the Loka Sabha?
a) Speaker
b) Deputy Speaker
c) Finance Minister
d) Prime Minister
72. Under which Article the state has been directed to secure for the citizens a 'uniform civil code' in India?
a) Art. 44
b) Art. 45
c) Art. 48
d) Art. 54
73. Which of the following refers to dishonesty in engineering ethics?
a) Self-interest
b) Cooking
c) Self-deception
d) Fear
74. Who among the following is empowered to suspend or revoke the license to issue digital signature certificate granted to a certifying authority?
a) Adjudicating Officer
b) Central Government
c) Controller
d) Cyber Appellate Tribunal
75. Who can appoint the Presiding Officer of the cyber appellate tribunal?
a) Central Government
b) State Government
c) President
d) Chief Justice of India
76. Software Piracy means
a) An attacker harasses a victim on line
b) Sending huge volumes of e-mail by an abuser to target address
c) Illegal copying, distribution, or use of software/computer
d) any software used to disrupt computer or mobile operations
77. Gaining and unauthorized access to the data or information stored in a computer system is called:
a) Malware
b) Hacking
c) Phishing
d) Web Jacking
78. What is a Mobile or SIM cloning?
a) Theft of information
b) Someone obtains others personal information
c) Copying the identity of one mobile telephone to another mobile telephone
d) All of the above

79. One of the modes of regulation of internet is
- a) Customs b) Norms c) International Law d) Native code
80. An important law relating to Indian cyber laws is
- a) Right to Information Act b) Right to Education Act
c) the Information Technology Act d) E-Commerce Code
81. 'Fault Tree' method is used
- a) To assess the risk b) In engineering research
c) To trace the fault of engineers d) to assess the accuracy of work
82. Under which law, a case is filed to recover damages when harm is caused from technology?
- a) Constitutional Law b) Industrial Law c) Law of Torts d) Law of Crimes
83. Revealing confidential information amounts to
- a) Misusing the truth
b) Breach of contract
c) Using of Copyright without the permission owner
d) Criminal breach of trust
84. The owner of the patent right retains his patent right for
- a) 50 years b) 75 years c) 20 years d) 10 years
85. When a state emergency is declared, who can assume all the functions of State Government?
- a) Prime Minister b) President of India
c) Governor of a State d) Union Cabinet
86. The Election Commission has no power to conduct the election to
- a) Parliament b) President
c) Speaker of Loka Sabha d) State Legislature
87. Who can appoint Prime Minister of India?
- a) The people of India b) The President of India
c) Ruling Legislative Party d) Election Commissioner
88. What is the maximum strength of Rajya Sabha?
- a) 224 b) 250 c) 288 d) 543
89. Vice-President of India is elected by the
- a) People of India b) Members of State Legislature
c) Members of Rajya Sabha d) Members of both the houses of parliament
90. What is the minimum age to become the judges of the Supreme Court?
- a) 25 years b) 30 years c) 35 years d) None of these
91. Chief Minister of a state is appointed by
- a) Governor b) President
c) High Command of a political party d) Chief Justice of the High Court

92. Which one of the following is not a fundamental duty?
a) Respect the National Flag and National Anthem
b) Not to destroy public property
c) Protection of environment and forest
d) Parents or wards may not send their children to school
93. The constitution empowered State Government to make special law for the protection of
a) Factory workmen
b) Unemployed youth
c) Women and children
d) Farmers
94. Every citizen of India is eligible to vote in an election after attaining the age of
a) 21 years
b) 16 years
c) 25 years
d) 18 years
95. Total number of articles and schedules in Indian Constitution are
a) 397 Articles and 6 Schedules
b) 385 articles and 8 Schedules
c) 440 Articles and 10 Schedules
d) 445 Articles and 12 Schedules
96. In engineering ethics, "tight coupling" means
a) Strong adhesive material
b) Binding two beams tightly
c) Process tightly coupled
d) Erecting two pillars side by side
97. Who is the Constitutional Head of the Nation?
a) Chief Justice of India
b) President of India
c) Prime Minister of India
d) Union External Affairs Minister
98. The resignation letter of President can be received and accepted by
a) Chief Justice of India
b) Vice-President of India
c) Prime Minister of India
d) Speaker of Loka Sabha
99. Who can administer the oath to the Chief Minister and Cabinet Minister of State Government?
a) President of India
b) Governor of State
c) Chief Justice of High Court
d) Advocate-General of State
100. The President can promulgate on ordinance only when
a) The parliament is not in session
b) There is a disagreement between the two houses of parliament
c) The bill is in pending in the parliament for a year and above
d) The Prime Minister recommends at anytime.

CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18MATDIP31

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

Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Prove that $(1 + \cos\theta + i \sin\theta)^n + (1 + \cos\theta - i \sin\theta)^n = 2^{n+1} \cos^n\left(\frac{\theta}{2}\right) \cos\left(\frac{n\theta}{2}\right)$. (08 Marks)
- b. Express $1 - i\sqrt{3}$ in the polar form and hence find its modulus and amplitude. (06 Marks)
- c. Find the argument of $\frac{1 + \sqrt{3}i}{1 - \sqrt{3}i}$. (06 Marks)

OR

- 2 a. If $\vec{A} = 4\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{B} = 2\hat{i} - \hat{j} + 2\hat{k}$ find a unit vector \hat{N} perpendicular to both \vec{A} and \vec{B} such that \vec{A} , \vec{B} and \vec{N} form a right handed system. (08 Marks)
- b. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$ then show that $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ are orthogonal. (06 Marks)
- c. Show that the position vectors of the vertices of a triangle $\vec{A} = 3(\sqrt{3}\hat{i} - \hat{j})$, $\vec{B} = 6\hat{i}$ and $\vec{C} = 3(\sqrt{3}\hat{i} + \hat{j})$ form an isosceles triangle. (06 Marks)

Module-2

- 3 a. Obtain the Maclaurin series expansion of $\log \sec x$ upto to the terms containing x^6 . (08 Marks)
- b. If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$, prove that $xu_x + yu_y = \sin 2u$. (06 Marks)
- c. If $u = f(x - y, y - z, z - x)$, show that $u_x + u_y + u_z = 0$. (06 Marks)

OR

- 4 a. Prove that $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} \dots$ by using Maclaurin's series notation. (08 Marks)
- b. Using Euler's theorem, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3u \log u$. If $u = e^{\frac{x^2 y^2}{x+y}}$. (06 Marks)
- c. If $u = x + y$, $v = y + z$, $w = z + x$, find $J \begin{pmatrix} u, v, w \\ x, y, z \end{pmatrix}$. (06 Marks)

Module-3

- 5 a. A particle moves along the curve $\vec{r} = \cos 2t \hat{i} + \sin 2t \hat{j} + t \hat{k}$, find the velocity and acceleration at $t = \frac{\pi}{8}$ along $\sqrt{2} \hat{i} + \sqrt{2} \hat{j} + \hat{k}$. (08 Marks)
- b. Find the unit normal to the surface, $xy + x + zx = 3$ at $(1, 1, 1)$. (06 Marks)
- c. Find the constant 'a' such that the vector field $\vec{F} = 2xy^2z^2\hat{i} + 2x^2yz^2\hat{j} + ax^2y^2z\hat{k}$ is irrotational. (06 Marks)

OR

- 6 a. If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ show that $\vec{F} \cdot \text{curl } \vec{F} = 0$. (08 Marks)
- b. If $\phi(x, y, z) = xy^2 + yz^3$, find $\nabla\phi$ & $|\nabla\phi|$ at $(1, -2, -1)$ (06 Marks)
- c. Show that vector field $\vec{F} = \left[\frac{xi + yj}{x^2 + y^2} \right]$ is solenoidal. (06 Marks)

Module-4

- 7 a. Obtain a reduction for $\int_0^{\frac{\pi}{2}} \sin^n x dx$ ($n > 0$). (08 Marks)
- b. Evaluate $\int_0^1 \frac{x^9}{\sqrt{1-x^2}} dx$. (06 Marks)
- c. Evaluate $\iint_R xy dx dy$ where R is the first quadrant of the circle $x^2 + y^2 = a^2$, $x \geq 0, y \geq 0$. (06 Marks)

OR

- 8 a. Obtain a reduction formula for $\int_0^{\frac{\pi}{2}} \cos^n x dx$, ($n > 0$). (08 Marks)
- b. Evaluate $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$. (06 Marks)
- c. Evaluate $\int_{-1}^1 \int_0^{x+2} \int_{x-2}^z (x + y + z) dy dx dz$ (06 Marks)

Module-5

- 9 a. Solve $\frac{dy}{dx} + y \cot x = \sin x$. (08 Marks)
- b. Solve $\cos x \sin y dx + \cos y \sin x dy = 0$. (06 Marks)
- c. Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x$. (06 Marks)

OR

- 10 a. Solve: $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$. (08 Marks)
- b. Solve: $\frac{dy}{dx} + \frac{y}{x} = y^2 x$. (06 Marks)
- c. Solve: $\sqrt{1-y^2} dx = (\sin^{-1} y - x) dy$ (06 Marks)
