

CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, June/July 2023 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 $L\left(\frac{\cos at - \cos bt}{t}\right)$. (06 Marks)
- b. Express the function in terms of unit step function and hence find Laplace transform of
$$f(t) = \begin{cases} \sin t & 0 < t < \frac{\pi}{2} \\ \cos t & \frac{\pi}{2} < t < \pi \end{cases}$$
 (07 Marks)
- c. Solve $y''(t) + 4y'(t) + 3y(t) = e^t$, $y(0) = y'(0) = 1$ by using Laplace transform method. (07 Marks)

OR

- 2 a. Find : (i) $L^{-1}\left(\log\left(\frac{s+b}{s+a}\right)\right)$ (ii) $L^{-1}\left(\frac{s+3}{s^2-4s+13}\right)$ (06 Marks)
- b. Find $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$ by using convolution theorem. (07 Marks)
- c. Given $f(t) = \begin{cases} t & 0 < t < a \\ 2a-t & a < t < 2a \end{cases}$
where $f(t) = f(t+2a)$ then show that $L(f(t)) = \frac{1}{s^2} \tan h\left(\frac{as}{2}\right)$ (07 Marks)

Module-2

- 3 a. Obtain Fourier series for $f(x) = \frac{\pi-x}{2}$, $0 < x < 2\pi$. (06 Marks)
- b. Find Fourier series for $f(x) = 2x - x^2$, $0 < x < 2$. (07 Marks)
- c. Find half range Fourier cosine series for
$$f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi-x, & \frac{\pi}{2} < x < \pi \end{cases}$$
 (07 Marks)

OR

- 4 a. Find Fourier series for $f(x) = |x|$, $-\pi < x < \pi$. (06 Marks)
- b. Obtain Fourier series for $f(x) = \begin{cases} 0 & -2 < x < 0 \\ 1 & 0 < x < 2 \end{cases}$. (07 Marks)
- c. Find the Fourier series upto first harmonic from the following table:

x	0	1	2	3	4	5
y = f(x)	4	8	15	7	6	2

(07 Marks)

Module-3

- 5 a. Find Fourier transform of
- $f(x)$
- , given:

$$f(x) = \begin{cases} 1, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases} \text{ and hence deduce that } \int_0^{\infty} \frac{\sin x}{x} dx = \frac{\pi}{2}. \quad (06 \text{ Marks})$$

- b. Find the Fourier cosine transform of

$$f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4-x & 1 < x < 4 \\ 0 & x > 4 \end{cases} \quad (07 \text{ Marks})$$

- c. Solve
- $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$
- , given
- $u_0 = 0, u_1 = 1$
- using Z - transform. (07 Marks)

OR

- 6 a. Find the Fourier sine transform of
- $e^{-|x|}$
- and hence evaluate
- $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx$
- . (06 Marks)

- b. Find Z-transform of
- $\cos n\theta$
- and
- $a^n \cos n\theta$
- . (07 Marks)

- c. Obtain the inverse Z-transform of
- $\frac{2z^2 + 3z}{(z+2)(z-4)}$
- . (07 Marks)

Module-4

- 7 a. Find the value of
- y
- at
- $x = 0.1$
- and
- $x = 0.2$
- given
- $\frac{dy}{dx} = x^2 y - 1, y(0) = 1$
- by using Taylor's series method. (06 Marks)

- b. Compute
- $y(0.1)$
- , given
- $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$
- taking
- $h = 0.1$
- , by using Runge-Kutta 4
- th
- order method. (07 Marks)

- c. Find the value of
- y
- at
- $x = 0.4$
- , given
- $\frac{dy}{dx} = 2e^x - y$
- with initial conditions
- $y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.04, y(0.3) = 2.09$
- by using Milne's predictor and corrector method. (07 Marks)

OR

- 8 a. Using modified Euler's method, find the value of
- y
- at
- $x = 0.1$
- , given
- $\frac{dy}{dx} = -xy^2, y(0) = 2$
- taking
- $h = 0.1$
- . (06 Marks)

- b. Solve
- $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0$
- at
- $x = 0.1$
- taking
- $h = 0.1$
- , by using Runge-Kutta 4
- th
- order method. (07 Marks)

- c. Find the value
- y
- at
- $x = 0.8$
- given
- $\frac{dy}{dx} = x - y^2$
- and

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

By using Adam's Bashforth predictor and corrector method. (07 Marks)

Module-5

- 9 a. Solve $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for $x = 0.2$ given $x = 0, y = 1$ and $\frac{dy}{dx} = 0$ by using Runge-Kutta method. (07 Marks)
- b. Derive Euler's equation in the standard form $\frac{\partial f}{\partial y} = \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. (06 Marks)
- c. Find the extremal of the function $\int_0^1 [(y')^2 + 12xy] dx$ with $y(0) = 0$ and $y(1) = 1$. (07 Marks)

OR

- 10 a. Find the value of y at $x = 0.8$, given $\frac{d^2y}{dx^2} = 2y \frac{dy}{dx}$ and

x	0	0.2	0.4	0.6
y	1	0.2027	0.4228	0.6841
y'	1	1.041	1.179	1.468

- by using Milne's method. (07 Marks)
- b. Prove that the shortest between two points in a plane is a straight line. (06 Marks)
- c. Find the curve on which the functional $\int_0^1 [x + y + (y')^2] dx$ with $y(0) = 1, y(1) = 2$. (07 Marks)

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Third Semester B.E. Degree Examination, June/July 2023 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. Express the complex number $\frac{(3+i)(1-3i)}{2+i}$ in the form $x + iy$. Also find its magnitude. (06 Marks)
- b. Find the cube roots of $l - i$ and represent them in an argand plane. (07 Marks)
- c. If $\vec{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\vec{b} = 8\hat{i} - 4\hat{j} + \hat{k}$ then show that \vec{a} is perpendicular to \vec{b} , also find $|\vec{a} \times \vec{b}|$. (07 Marks)

OR

- 2 a. Find the modulus and amplitude of $1 - \cos \alpha + i \sin \alpha$. (06 Marks)
- b. If $\vec{a} = \hat{i} + \hat{j} - \hat{k}$; $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{c} = 3\hat{i} - \hat{j} - \hat{k}$, find
 i) $\vec{a} \cdot (\vec{b} \times \vec{c})$ ii) $\vec{b} \times (\vec{a} \times \vec{c})$. (07 Marks)
- c. Prove that $[\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}] = [\vec{a}, \vec{b}, \vec{c}]^2$. (07 Marks)

Module-2

- 3 a. Using Maclaurin's series, prove that $\sqrt{1 + \sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{24} - \dots$. (06 Marks)
- b. If $u = \tan^{-1} \left(\frac{x^3 + y^3}{x - y} \right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$. (07 Marks)
- c. If $u = 1 - x$, $v = x(1-y)$, $w = xy(1-z)$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$. (07 Marks)

OR

- 4 a. Obtain the Maclaurin's expansion of the function $\log(1 + e^x)$. (06 Marks)
- b. If $u = f(x-y, y-z, z-x)$, Prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. (07 Marks)
- c. If $u = x + y + z$, $w = y + z$, $z = uvw$, find $\frac{\partial(x, y, z)}{\partial(u, v, w)}$. (07 Marks)

Module-3

- 5 a. A particle moves along a curve C with parametric equations $x = t - \frac{t^3}{3}$, $y = t^2$ and $z = t + \frac{t^3}{3}$, where t is the time. Find the velocity and acceleration and any time t and also find their magnitudes at $t = 3$. (06 Marks)
- b. Find $\text{div } \vec{F}$ and $\text{Curl } \vec{F}$, where $\vec{F} = \nabla (x^3 + y^3 + z^3 - 3xyz)$. (07 Marks)
- c. Find the directional derivative of $\phi = x^2 yz^3$ at $(1, 1, 1)$ in the direction of $\hat{i} + \hat{j} + 2\hat{k}$. (07 Marks)

OR

- 6 a. Show that the vector field $\vec{F} = yz\hat{i} + xz\hat{j} + xy\hat{k}$ is solenoidal vector field. (06 Marks)
- b. If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$, show that $\vec{F} \cdot \text{curl } \vec{F} = 0$. (07 Marks)
- c. Find the constants a, b, c such that $\vec{F} = (x + y + az)\hat{i} + (x + cy + 2z)\hat{k} + (bx + 2y - z)\hat{j}$ is irrotational. (07 Marks)

Module-4

- 7 a. Obtain the Reduction formula for $\int_0^{\pi/2} \cos^n x \, dx$. (06 Marks)
- b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) \, dy \, dx$. (07 Marks)
- c. Evaluate $\int_0^1 \int_0^1 \int_0^1 (x + y + z) \, dx \, dy \, dz$. (07 Marks)

OR

- 8 a. Evaluate $\int_1^2 \int_0^{3-y} xy \, dx \, dy$. (06 Marks)
- b. Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} \, dx \, dy \, dz$. (07 Marks)
- c. Obtain the Reduction formula $\int \sin^m x \cos^n x \, dx$. (07 Marks)

Module-5

- 9 a. Solve : $(x^2 + y) \, dx + (y^3 + x) \, dy = 0$. (06 Marks)
- b. Solve : $x \log x \frac{dy}{dx} + y = 2 \log x$. (07 Marks)
- c. Solve : $\frac{dy}{dx} + \frac{y}{x} = y^2 x$. (07 Marks)

OR

- 10 a. Solve : $y e^y \, dx = (y^3 + 2x e^y) \, dy$. (06 Marks)
- b. Solve : $(x^2 - y^2) \, dx = 2xy \, dy$. (07 Marks)
- c. Solve : $[1 + (x + y) \tan y] \frac{dy}{dx} + 1 = 0$. (07 Marks)

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18CS32

Third Semester B.E. Degree Examination, June/July 2023 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. Explain with block schematic various types of data structures along with examples. Also list out various basic operations that can be performed on data structures. (10 Marks)
- b. Define sparse matrix. Express the given matrix in sparse representation, triplet form and transpose.

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 9 & 0 \\ 0 & 8 & 0 & 0 & 0 & 0 \\ 4 & 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 5 \\ 0 & 0 & 2 & 0 & 0 & 0 \end{bmatrix}$$

(10 Marks)

OR

- 2 a. Explain the following dynamic memory allocation functions along with syntax and example: (i) Malloc (ii) Calloc (iii) realloc (iv) free (10 Marks)
- b. Outline the prefix function of Knuth Morris Pratt algorithm. Also implement the same to find the occurrence of the following pattern P in main string S.
S : B A C B A B A B A B A C A C A
P : A B A B A C A (10 Marks)

Module-2

- 3 a. Write a C program to perform push (), pop(), display operation on STACK. (10 Marks)
- b. Outline the algorithm for convert an infix expression to postfix one using the same algorithm, convert the following infix expression to postfix expression.
((A * (B + D) | E) - F * (G + H | K)) (10 Marks)

OR

- 4 a. Write a C program to perform insertion, deletion and display operation on queue. (10 Marks)
- b. Outline algorithm for evaluation of a valid postfix expression. Evaluate the expression $ab + cd + *e/$. Let $a = b = c = d = e = 4$. (10 Marks)

Module-3

- 5 a. Write C function for :
(i) Inserting a node at the beginning of single linked list (10 Marks)
(ii) Inserting a node at the end of single linked list
- b. Explain concept of sparse matrix representation using linked list. Represent the following sparse matrix in linked list format.

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

(10 Marks)

OR

- 6 a. Write C functions for:
- (i) Concatenation of single linked list
 - (ii) Reverse a single linked list. (10 Marks)
- b. Write C function to add two polynomials. Show the linked list representation of the below two polynomials and its addition. (10 Marks)
- P1 : $5x^2 + 4x + 2$
 P2 : $5x + 5$
 O/P : $5x^2 + 9x + 7$

Module-4

- 7 a. Write recursive C routine for preorder, inorder and postorder traversals of a tree. Also find all the three transversal of the following tree.

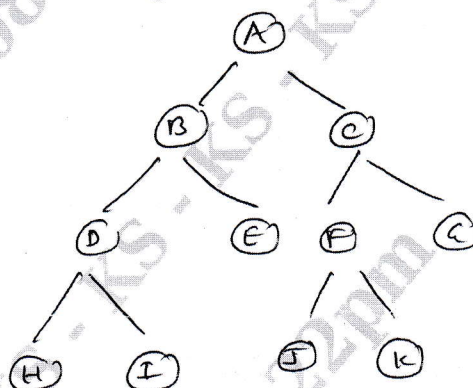


Fig.Q7(a)

(10 Marks)

- b. Draw a binary search tree for following input of elements:
 43 10 79 90 12 54 11 9 50
 Also write a C function to search for an element in BST.

(10 Marks)

OR

- 8 a. Define threaded binary tree. Explain one way and two way threaded binary tree. Represent the following tree in the form of one way and two way threaded binary tree.

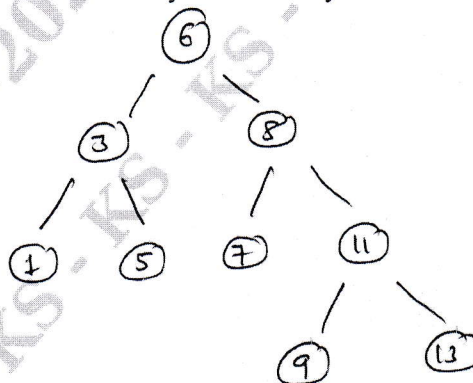


Fig.Q8(a)

(10 Marks)

- b. Outline the steps involved in construction of an expression tree. Construct expression tree for the following input : $A B + C *$ (10 Marks)

Module-5

- 9 a. Explain the following representation of graph:
 (i) Adjacency matrix (ii) Edge list (iii) Adjacency list
 Represent the following graph in above style.

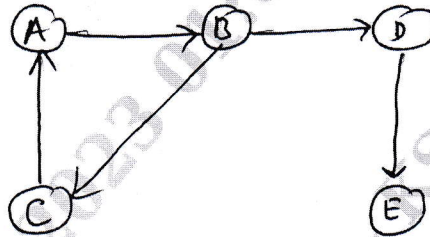


Fig.Q9(a)

(10 Marks)

- b. Arrange the following elements in ascending order using Radix sort:
 143, 74, 875, 342, 23, 477, 17, 689, 128, 87

(10 Marks)

OR

- 10 a. Explain hashing and collision. What are methods to resolve collision? Provide example for each. (10 Marks)
- b. Write algorithm for DFS and BFS traversal for a given graph $G = (V, E)$. (10 Marks)

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18CS33

Third Semester B.E. Degree Examination, June/July 2023 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

- 1 a. With neat diagram, explain construction, working principle and V-I characteristics of photodiode. (10 Marks)
- b. Explain the operation of Astable Multivibrator using IC-555, also shows the circuit configuration, waveforms and relevant supporting voltage and time expressions. (10 Marks)

OR

- 2 a. Discuss the working of Relaxation Oscillator with neat supporting diagram. Derive the expression for total time required for one oscillation. (10 Marks)
- b. Define the following terms with respect to voltage regulator:
(i) Load Regulation (ii) Line Regulation (iii) Voltage stability factors (05 Marks)
- c. Explain the connection of LM317 adjustable voltage regulator. (05 Marks)

Module-2

- 3 a. Fig.Q3(a) shows for an automobile alarm circuit used to detect certain undesirable conditions. The three switches are used to indicate the status of the door by the driver's seat, the ignition and the headlights respectively. Design the logic circuit with these switches as input so that the alarm will be activated wherever either of the following conditions exists.
(i) The headlights are on while the ignition is off.
(ii) The door is open while the ignition is on.
Write truth table and use K-map to get simplified expression implement the same using basic gates.

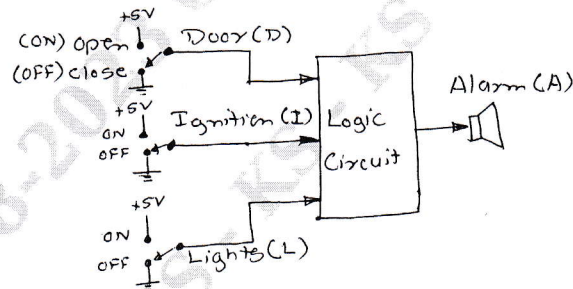


Fig.Q3(a)

- b. Find the minimum sum of product using K-map for each function. (10 Marks)
(i) $f(a, b, c, d) = \pi M(0, 1, 6, 8, 11, 12) \cdot \pi D(3, 7, 14, 15)$
- (ii) $f(a, b, c, d) = \sum m(1, 3, 4, 11) + \sum d(2, 7, 8, 12, 14, 15)$ (10 Marks)

OR

- 4 a. For the following function, find a minimum sum of product solution using the Quine-McCluskey method: $f(a, b, c, d) = \sum m(1, 3, 4, 5, 6, 7, 10, 12, 13) + \sum d(2, 9, 15)$ (08 Marks)
- b. Find all prime implicants of the following function and then find all minimum solutions using Petrick's method:
 $F(A, B, C, D) = \sum m(9, 12, 13, 15) + \sum d(1, 4, 5, 7, 8, 11, 14)$ (12 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-3

- 5 a. Define static hazards. With neat supporting circuit, K-map and Timing diagram, explain Static-1 Hazard. Also explain how static - 1 hazard can be removed from circuit. (12 Marks)
- b. (i) Show how two 2-to-1 MUX (with no added gates) could be connected to form 3 to 1 MUX. Input selection should be as follows:
 If $AB = 00$, select I_0
 If $AB = 01$, select I_1
 If $AB = 1X$ (B is a don't care) select I_2
- (ii) Show how two 4 to 1 and one 2 to 1 MUX could be connected to form an 8 to 1 MUX with three control inputs.
- (iii) Show how four 2 to 1 and one 4 to 1 MUX could be connected to form an 8 to 1 MUX with three control inputs. (08 Marks)

OR

- 6 a. For each item, indicate whether it is referring to a decoder, an encoder or a MUX.
 (i) Has more input than outputs.
 (ii) Produces a binary code at its output.
 (iii) Only one of its outputs can be active at one time.
 (iv) Uses SELECT inputs.
 (v) Can be used to generate arbitrary logic functions (05 Marks)
- b. Realize a full adder using a 3 to 8 line decoder and (i) two OR gates (ii) two NOR gates. (05 Marks)
- c. With neat supporting diagram compare PLA and PAL. Implement the following equation using PLA:
 $X = AB'D + A'C' + BC + C'D'$
 $Y = A'C' + AC + C'D'$
 $Z = CD + A'C' + AB'D$ (10 Marks)

Module-4

- 7 a. Write a VHDL module that implements a half adder, a full adder, a half subtractor and a full subtractor. (10 Marks)
- b. Write a VHDL module for 8 to 1 MUX. (05 Marks)
- c. Draw the circuit represented by the following VHDL statements.
 $F <= E \text{ and } I;$
 $I <= G \text{ or } H;$
 $G <= A \text{ and } B;$
 $H <= \text{not } C \text{ and } D;$ (05 Marks)

OR

- 8 a. Explain the working of SR Latch with neat circuit diagram, truth table and timing diagram. (10 Marks)
- b. With a neat logic diagram, truth table and timing diagram, explain the working of J-K Master Slave flip-flop. (10 Marks)

Module-5

- 9 a. Discuss the working of n-bit parallel adder with accumulator. (10 Marks)
- b. Implement the shift register using MUX and D flip-flop and write the timing diagram for the same. (10 Marks)

OR

- 10 a. Design a 3-bit synchronous binary counter using T-flip flop. Write transition table, K-map and circuit diagram. (08 Marks)
- b. Design a 3-bit counter which counts in the sequence:
 001, 011, 010, 110, 111, 101, 100, (Repeat) 001,
 Use J-K flip-flop (12 Marks)

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18CS34

Third Semester B.E. Degree Examination, June/July 2023 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. Explain the basic operation concepts of the computer with neat diagram. (08 Marks)
b. Write a program to evaluate the arithmetic statement $Y = (A + B) * (C + D)$ using three address, two address and one address instruction. (08 Marks)
c. Explain the following :
i) Big endian assignment ii) Little endian assignment (04 Marks)

OR

- 2 a. What is an addressing mode? Explain any four types of addressing modes, with suitable example. (10 Marks)
b. How the input and output operations are performed by the processor? Write a program that reads line or characters and display it. (10 Marks)

Module-2

- 3 a. With neat sketches, explain various methods for handling interrupts raised by multiple devices. (10 Marks)
b. What is DMA Bus arbitration? Explain different bus arbitration techniques. (10 Marks)

OR

- 4 a. Explain synchronous bus and asynchronous bus with neat diagrams. (10 Marks)
b. With the help of timing diagram explain the read operation on the PCI bus. (10 Marks)

Module-3

- 5 a. With a neat diagram explain the internal organization of 16×8 memory chip. (10 Marks)
b. Describe the working of static RAM memories. (05 Marks)
c. What is memory interleaving? Explain. (05 Marks)

OR

- 6 a. What is cache memory? Explain the three mapping functions of cache memory. (10 Marks)
b. Analyse how data is written into ROM. Discuss different types of Read Only Memories. (10 Marks)

Module-4

- 7 a. Convert the following pairs of decimal numbers to 5 figure signed 2's complement binary number and add them. State whether overflow has occurred.
i) - 5 and 7 ii) -10 and -13 iii) -14 and 11 (06 Marks)
b. Draw 4-bit carry look ahead adder and explain. (06 Marks)
c. Explain Booth's algorithm. Multiply +13 and -6 using Booth's algorithm. (08 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

- 8 a. Perform the division of $8 \div 3$ using restoring division. (08 Marks)
b. Explain the concept of carry-save addition for multiplication operation $M \times Q = P$ for 4-bit operands with diagram and example. (06 Marks)
c. Explain IEEE standard for floating point numbers. (06 Marks)

Module-5

- 9 a. Write and explain the control sequence for execution of the instruction $\text{Add}(R_3), R_1$. (10 Marks)
b. Explain the three-bus organization of the data path. (10 Marks)

OR

- 10 a. Briefly explain Hardwired control and micro programmed control. (10 Marks)
b. What is pipeline? Explain 4 stages of pipeline with its instruction execution steps and hardware organization. (10 Marks)

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18CS35

Third Semester B.E. Degree Examination, June/July 2023 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. Define Software Engineering? Briefly discuss the attributes of good software? (10 Marks)
b. Through a neat diagram, explain the incremental development process? Also mention the benefits of this model when compared to waterfall model? (10 Marks)

OR

- 2 a. Give the sketch of requirement engineering process and explain the different stages? (10 Marks)
b. Indicate why requirement validation is needed. Discuss different checks to be carried out during requirement validation process. (10 Marks)

Module-2

- 3 a. What is object orientation? List and explain the aspects of object oriented approach? (10 Marks)
b. Why models are created? Summarize the three different models of objects oriented development. (10 Marks)

OR

- 4 a. Explain the object and class diagram concept with example. (10 Marks)
b. State the following terms with example
i) Multiplicity ii) Association end name iii) Ordering iv) Bags and sequences
v) Association class. (10 Marks)

Module-3

- 5 a. Illustrate the state diagram of micro wave oven application in event driven model. (10 Marks)
b. Describe the following with example.
i) Class diagram and association ii) Generalization iii) Aggregation. (10 Marks)

OR

- 6 a. What is design pattern? Briefly discuss the essential elements of design pattern. (10 Marks)
b. With a neat block diagram, explain the phases of Rational Unified Model (RUD). (10 Marks)

Module-4

- 7 a. Write a note on software testing? Illustrate the idea of component interface testing. (10 Marks)
b. Discuss Test Driven Development (TDD) with its process and benefits. (10 Marks)

OR

- 8 a. What is user testing? Explain six stages of acceptance testing. (10 Marks)
b. Outline Lehman's laws of program evaluation dynamics (Any five) (10 Marks)

Module-5

- 9 a. Define software pricing. Discuss the factors affecting software process. (10 Marks)
b. Name of project plan sections and explain in detail. (10 Marks)

OR

- 10 a. How would you define software Quality? Briefly discuss the software quality attributes. (10 Marks)
b. Elaborate the purpose of program inspection? Analyze the different inspection checks/fault classes done during program inspection. (10 Marks)

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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.

CBCS SCHEME

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18CS36

Third Semester B.E. Degree Examination, June/July 2023 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. Indicate how many rows are needed for the truth table of the compound proposition :
 $(p \vee \neg q) \leftrightarrow \{(\neg r \wedge s) \rightarrow t\}$
Find the truth value of this proposition if p and r are true and q, s, t are false. (07 Marks)
- b. Prove that the following argument is valid :
$$\frac{\forall x, [p(x) \rightarrow \{q(x) \wedge r(x)\}]{\quad} \forall x, [p(x) \wedge s(x)]}{\therefore \forall x, [r(x) \wedge s(x)]}$$
 (07 Marks)
- c. Prove that for all integers 'k' and 'l', if 'k' and 'l' are both odd, then k + l is even and kl is odd by direct proof. (06 Marks)

OR

- 2 a. Prove that for any three propositions p, q, r
 $[(p \vee q) \wedge (p \vee \neg q) \vee q] \leftrightarrow p \vee q$
Using truth table. (07 Marks)
- b. Test the validity of the argument :
$$\frac{P \rightarrow (q \rightarrow r){\quad} \neg q \rightarrow \neg p}{P}$$

$$\therefore r$$
 (07 Marks)
- c. Write down the following proposition in symbolic form, and find its negation :
"If all triangles are right - angled, then no triangle is equiangular". (06 Marks)

Module-2

- 3 a. Prove by mathematical induction that, for any positive integer n
 $1 + 5 + 9 + \dots + (4n - 3) = n(2n - 1)$. (07 Marks)
- b. In the word SOCIOLOGICAL
i) How many arrangements are there for all letters in the word?
ii) In how many arrangements all vowels are adjacent?
iii) In how many arrangements A and G are adjacent. (07 Marks)
- c. In how many ways can 10 identical pencils be distributed among 5 children in the following cases :
i) There are no restrictions
ii) Each child gets at least one pencil
iii) The youngest child gets atleast two pencils. (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.

OR

- 4 a. Prove by mathematical induction that
 $4^n < n^2 - 7$ for all integers $n \geq 6$. (07 Marks)
- b. Find the coefficient :
 i) x^{12} in the expansion of $x^3(1 - 2x)^{10}$
 ii) xyz^2 in the expansion of $(2x - y - z)^4$. (07 Marks)
- c. Find the number of arrangements of all the letters in TALLAHASSEE. How many of these arrangements have no adjacent A's? (06 Marks)

Module-3

- 5 a. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be defined by
 $f(a) = 2a + 1$, $g(b) = \frac{1}{3}b$, $\forall a \in \mathbb{R}$, $\forall b \in \mathbb{R}$
 verify that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$. (07 Marks)
- b. ABC is an equilateral triangle whose sides are of length 1cm each. If we select 5 points inside the triangle, prove that at least two of these points are such that distance between them is less than $\frac{1}{2}$ cm. (07 Marks)
- c. Let $A = \{1, 2, 3, 4, 6, 8, 12\}$. On A, define the partial ordering relation R by xRy if and only if "x divides y". Draw the Hasse diagram for R by verifying R is a partial order on A. (06 Marks)

OR

- 6 a. For a fixed integer $n > 1$, prove that the relation "congruent modulo n" is an equivalence relation. (07 Marks)
- b. Consider the set $A = \{1, 2, 3, 4, 5\}$ and the equivalence relation :
 $R = \{(1, 1), (2, 2), (2, 3), (3, 2), (3, 3), (4, 4), (4, 5), (5, 4), (5, 5)\}$
 Defined on A. Find the partition of A induced by R. (07 Marks)
- c. Let f and g be functions from \mathbb{R} to \mathbb{R} defined by
 $f(x) = ax + b$ and $g(x) = 1 - x + x^2$. If $(g \circ f)(x) = 9x^2 - 9x + 3$.
 Determine a and b. (06 Marks)

Module-4

- 7 a. Determine the number of positive integers n such that $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5. (07 Marks)
- b. Find the rook polynomial for the board shown below :

1	2			
	3			
		4	5	
			6	7

(07 Marks)

- c. The number of virus affected files in a system is 1000(initially) and this increases 250% every 2 hours. Use recurrence relation to determine the number of virus affected files in the system after one day. (06 Marks)

OR

- 8 a. An apple, a banana, a mango and an orange are to be distributed to four boys B_1, B_2, B_3, B_4 . The boys B_1 and B_2 do not wish to have apple, the boy B_3 does not want banana or mango, and B_4 refuses orange. In how many ways the distribution can be made so that no boy is displeased. (07 Marks)
- b. There are right letters to eight different people to be placed in eight different addressed envelope, Find the number of ways of doing this so that at least one letter gets to the right person. (07 Marks)
- c. If a_n is a solution of the recurrence relation :

$$a_{n+1} = Ka_n \text{ for } n \geq 0 \text{ and } a_3 = 153/49, a_5 = \frac{1377}{2401}, \text{ what is } K? \quad (06 \text{ Marks})$$

Module-5

- 9 a. Prove that in every graph, the number of vertices of odd degree is even. (07 Marks)
- b. Examine whether the following graphs are isomorphic or not. (Refer Fig.Q9(b)).

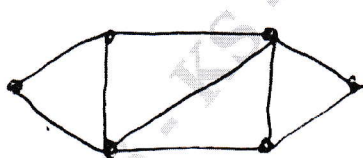
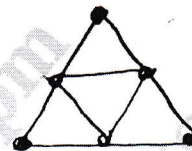


Fig.Q9(b)



(07 Marks)

- c. Apply merge sort to the list.
-1, 0, 2, -2, 3, 6, -3, 5, 1, 4. (06 Marks)

OR

- 10 a. Construct an optimal prefix code for the symbols a, o, q, u, y, z. (07 Marks)
- b. Let $T_1 = (V_1, E_1)$ and $T_2 = (V_2, E_2)$ be two trees. If $|E_1| = 19$ and $|V_2| = 3|V_1|$, determine $|V_1|, |V_2|$ and $|E_2|$. (07 Marks)
- c. Show that there is no graph with 28 edges and 12 vertices in the following cases :
i) The degree of a vertex is either 3 or 4
ii) The degree of a vertex is either 3 or 6. (06 Marks)

USN

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Question Paper Version : A

Third/Fourth Semester B.E Degree Examination, June/July 2023
Constitution of Indian, 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 constitution of India was enacted by a constitution assembly set up,
 - a) Union Cabinet mission plan 1946.
 - b) Under Indian Independence Act 1947
 - c) Under resolution of provincial government.
 - d) By Indian National Congress.
2. On December 11, 1946 the Constituent Assembly elected _____ as its permanent chairman.
 - a) Jawaharlal Nehru
 - b) Dr. Rajendra prasad
 - c) Dr. B. R. Ambedkar
 - d) K. M. Munshi
3. The drafting committee of the constitution including the chairman comprised of,
 - a) 7 members
 - b) 9 members
 - c) 11 members
 - d) 5 members
4. The constitution of India is,
 - a) Rigid
 - b) Flexible
 - c) Partly rigid partly flexible
 - d) Very very rigid
5. The preamble of constitution declares India to be,
 - a) Sovereign democratic republic
 - b) Socialist democratic republic
 - c) Sovereign, Socialist, Secular democratic and Republic
 - d) None of these

6. In which case did the supreme court give a ruling preamble was part of the constitution.
 a) Berubari case
 b) Golaknath case
 c) Keshavananda Bharathi case
 d) None of these
7. What is the chief source of political powers in the country?
 a) The constitution
 b) The people
 c) The legislature
 d) The parliament
8. The original constitution classified. The "Fundamental Rights" into seven categories but now there are.
 a) 4 categories
 b) 5 categories
 c) 6 categories
 d) 7 categories
9. Which one of the following fundamental Right was described by Dr.B.R. Ambedkar as "the heart and soul of constitution".
 a) Right to Equality
 b) Right to constitutional Remedies
 c) Right to Freedom
 d) Right to Religion
10. The main objective of cultural and educational right granted to the citizens is,
 a) To preserve rich culture and heritage of India.
 b) To evolve single integrated Indian culture
 c) To help minorities to conserve their culture.
 d) All the above
11. For enforcement of fundamental Right the court can issue,
 a) A Decree
 b) An ordinance
 c) A writ
 d) A notification
12. Which of the following literally means you may have the body,
 a) A Mandamus
 b) Habeas corpus
 c) Prohibition
 d) Quo-warranto
13. "Equal work for equal pay" is a
 a) Fundamental Right
 b) Directive principle
 c) Fundamental duty
 d) Statutory provision is labour law
14. 73rd and 74th amendment is pertaining to
 a) Stalehood of Goa
 b) Extention of reservation to SC and ST
 c) Local self government
 d) Land reforms
15. The enforcement of Directive principles depends upon,
 a) The resources available with the Government
 b) The president
 c) The Court
 d) Chief justice of India
16. Common Civil code means,
 a) Common civil procedure code
 b) Common civil law applicable to all
 c) Civil law applicable to common man
 d) None of the above
17. The concept of DPSP is borrowed from the constitution of,
 a) Ireland
 b) Russia
 c) Great Britain
 d) USA

18. The constitution of India adopted fundamental duty from,
a) America b) Russia c) Ireland d) Britain
19. Fundamental duties did not form to be original part of Indian constitution they were added under _____ amendment.
a) 42nd Amendment Act b) 44th Amendment Act
c) 86th Amendment Act d) None of these
20. At present how many "Fundamental duties" are their in the constitution of India.
a) 6 duties b) 8 duties c) 10 duties d) 11 duties
21. Article 370 which gave special status to Jammu and Kashmir existed in the Indian constitution because of the agreement between,
a) Jawaharlal and Farukh Abdullah b) Jawaharlal and Maharaja Hari sing
c) Vallabh bhai Patel and Maharaj Harising d) Mohammed Ali Jinnah and J.L.Nehru
22. Which is the Indian constitution day?
a) Jan-26 b) August-15 c) November-26 d) April-20
23. Legislate means,
a) Make law b) Make constitutional amendment
c) Form government d) Put administrative machinery into action
24. The Parliamentary form of government in India is based on,
a) Great Britain b) Japan c) Russia d) France
25. What is the system used to elect the president of India?
a) Preferential system b) Secret Ballot
c) Direct election d) Proportional representation
26. Who discharge the duty of the president in the event of president and vice president being not available?
a) The prime minister b) The chief justice of India
c) The speaker of lok sabha d) Vice president
27. Who represents the nation but does not rule the nation?
a) President b) Attorney general c) Chief Justice of India d) Vice President
28. Which one of the following house is presided by a non member?
a) Rajya Sabha b) Lok Sabha c) Vidhana Sabha d) Vidhana parishad
29. Respite means,
a) Painless death b) Death due to drowning
c) Due to stragulation d) awarding lesser punishment
30. The total number of union council of minister including the prime minister shall not exceed.
a) 10% of loksabha strength b) 15% of loksabha strength
c) 18% of loksabha strength d) no such restriction

31. Uni-Cameral means,
a) Presence of no house in the state
b) Presence of one house in the state
c) Presence of two house in the state
d) Present of half house in the state
32. The age qualification for becoming the member of Rajya Sabha and Lok Sabha is,
a) 25 yrs and 30 yrs
b) 30 yrs and 25 yrs
c) 35 yrs and 30 yrs
d) 30 yrs and 40 yrs
33. The state legislative Assembly is prorogued by,
a) Governor
b) Chief minister
c) Speaker of assembly
d) Chief justice of High court
34. Which of the following statement is not correct?
a) Money bill cannot be introduced in legislative council
b) The money bill is presented by chief minister of the state
c) The legislative council has no right to change the money bill
d) All of the above
35. Power of the supreme court to decide the dispute between the centre and the state fall under its,
a) Constitutional jurisdiction
b) Appellate jurisdiction
c) Advisory jurisdiction
d) Original jurisdiction
36. The High court judge unless resign earlier retire at the age of,
a) 58 years
b) 60 years
c) 62 years
d) 65 years
37. A bill presented in the parliament becomes law.
a) If passed by both the houses
b) The prime minister has signed it
c) The supreme court has decided or declared it.
d) When the president gives his assent
38. The judges of Supreme Court after retirement are not permitted to carry on practice before.
a) Supreme Court of India
b) High Court
c) District and Session Court
d) Any of these
39. One third of Rajya Sabha member retires,
a) Every year
b) Every two year
c) Every three years
d) Every four years.
40. Which among following is not a standing committee?
a) Public Committee
b) Ethics Committee
c) Railway convention Committee
d) Business advisory Committee
41. Election to the local self government is conducted by,
a) State Election Commission
b) Regional EC
c) Election commission
d) Governor
42. The citizens of India have got a right to cast his vote after attaining the age of _____ years.
a) 16 years
b) 18 years
c) 21 years
d) 24 years

43. Election to Lok Sabha and Legislative Assembly in India are conducted on the basis of,
 a) Single transferable vote
 b) Proportional representation
 c) Limited Suffrage
 d) Adult franchise
44. The Election Commissioner hold office till,
 a) For 5 years
 b) For 6 years
 c) During the pleasure of president
 d) 6 years or 65 years whichever is early
45. This is not a ground to declare National Emergency.
 a) Internal disturbance
 b) War
 c) External aggression
 d) Armed rebellion
46. How many times has a National Emergency has been declared so far?
 a) Once
 b) Twice
 c) Thrice
 d) Never
47. Break down of constitutional machinery in a state is popularly known as,
 a) State Emergency
 b) National Emergency
 c) Financial Emergency
 d) All of these
48. When National Emergency declared, the following Fundamental Right is suspended.
 a) Right to Equality (Art 14)
 b) Title (Art 18)
 c) Right to Freedom (Art 19)
 d) Right to life (Art 21)
49. Which type of emergency has not yet declared till now?
 a) National Emergency
 b) State Emergency
 c) Financial Emergency
 d) None of these
50. Who is considered to be a Vulnerable group?
 a) Women and Children
 b) SCs
 c) STs
 d) All of these
51. How many members will be nominated by President / Governor from Anglo Indian community?
 a) 2 / 1
 b) 1 / 2
 c) 3 / 2
 d) 2 / 3
52. Seats for SCs and STs are not reserved in,
 a) Lok Sabha
 b) Legislative Assembly
 c) Rajya Sabha
 d) All of these
53. Which of the Constitutional amendment reduced the voting right from 21 years to 18 years?
 a) 54th Amendment
 b) 36th Amendment
 c) 62th Amendment
 d) 61st Amendment
54. Which of the following amendment Act makes the Right to education as the fundamental right to all the children under the age of 6 to 14 years by inserting Art 21A to the constitution.
 a) 86th Amendment Act 2002
 b) 87th Amendment Act 2003
 c) 88th Amendment Act 2003
 d) 89th Amendment Act 2003

55. Which of the following amendment was passed during the emergency?
 a) 42nd Amendment Act
 b) 44th Amendment Act
 c) 47th Amendment Act
 d) 50th Amendment Act
56. In how many ways the constitutional amendments in India can take place?
 a) 2
 b) 3
 c) 4
 d) 5
57. The 7th Amendment of Indian constitution was done to implement recommendations of state on the basis of,
 a) linguistic
 b) Religion
 c) Population
 d) All of these
58. Which constitutional Amendment is done to pass the GST bill?
 a) 101st
 b) 120th
 c) 122nd
 d) 115th
59. The Ninety fourth Amendment of the constitution of India made provision for the appointment of minister in charge of tribal welfare in the state of,
 a) Bihar
 b) Chattisgarh and Jarkhand
 c) Madya Pradesh
 d) All the above
60. The 10th Amendment of the constitution of India Act 1961 incorporated _____ as seventh union territory of India.
 a) Dadar & Nagar Haveli
 b) Daman & Diu
 c) Andaman & Nicobar
 d) None of these
61. Engineering ethics is,
 a) Scientifically developed ethics
 b) Preventive ethics
 c) Developing ethics
 d) Natural ethics
62. A Fault tree is used to,
 a) Improve safety
 b) Take free consent
 c) Claim compensation
 d) Assess the risk involved
63. One of the characteristic of profession is
 a) It demands hard work
 b) It is based on honesty
 c) It is having taught competition
 d) usually its is having monopoly
64. One of impediment to responsibility is,
 a) Rampant corruption at higher level
 b) Self defection
 c) Interference by higher officers
 d) Interference by politicians
65. Good work means,
 a) Superior work done with great care and skill
 b) Work above and beyond the call of duty.
 c) Responsible work
 d) Work involving high risk
66. "Egocentric tendencies" means
 a) Interpreting situation from limited view
 b) Superior complex
 c) Arrogant and irresponsible behaviour
 d) habit of condemning the view of other

94. Nitizen means,
a) A person who is citizen of a country b) A person who has dual citizenship
c) A person who uses internet d) None of these
95. What is the punishment for hacking of computers?
a) Three years imprisonment or 10 lac rupees or both
b) Life imprisonment
c) Three lac rupees or 3 years imprisonment
d) Three years imprisonment or 5 lac rupees penalty or both
96. What is the proposed punishment for cyber Terrorism in IT Act?
a) 1 crore rupees penalty b) Life imprisonment
c) 10 years imprisonment d) 6 years imprisonment
97. What is the term of office of the presiding officer of cyber appellate tribunal?
a) 3 years b) 4 years c) 5 years d) 6 years
98. What is the full form of ITA 2000?
a) Information tech act 2000 b) Indian technology act 2000
c) International technology act 2000 d) Information technology Act 2000
99. The first computer virus is,
a) I love you b) Blaster c) Sasser d) Creeper
100. Who is usually against net neutrality,
a) Content providers b) Consumers / end users
c) telecom companies d) All of these

* * * * *