USN | 1 | K | S | 1 | 5 | C | S | 0 | 2 | 1 | 17MAT31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 100

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

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-1

1 a. Find the Fourier series expansion of $f(x) = x - x^2$ in $(-\pi, \pi)$, hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ----$. **(08 Marks)**

b. Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 \le x \le 1$. **(06 Marks)**

c. Express y as a Fourier series upto first harmonics given :

x	0	60°	120°	180°	240°	300°
y	7.9	7.2	3.6	0.5	0.9	6.8

(06 Marks)

OR

2 a. Obtain the Fourier series for the function :

$$f(x) = \begin{cases} 1 + \frac{4x}{3} & \text{in } \frac{-3}{2} < x \le 0 \\ 1 - \frac{4x}{3} & \text{in } 0 \le x < \frac{3}{2} \end{cases}$$

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ---$. **(08 Marks)**

b. If $f(x) = \begin{cases} x & \text{in } 0 < x < \pi/2 \\ \pi - x & \text{in } \pi/2 < x < \pi \end{cases}$

Show that the half range sine series as

$$f(x) = \frac{4}{\pi}\left[\sin x - \frac{\sin 3x}{3^2} - \frac{\sin 5x}{5^2} ----\right].$$ **(06 Marks)**

c. Obtain the Fourier series upto first harmonics given :

x	0	1	2	3	4	5	6
y	9	18	24	28	26	20	9

(06 Marks)

Module-2

3 a. Find the complex Fourier transform of the function :

$$f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$$ and hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$. **(08 Marks)**

b. Find the Fourier cosine transform of e^{-ax}. **(06 Marks)**

c. Solve by using z – transforms $u_{n+2} - 4u_n = 0$ given that $u_0 = 0$ and $u_1 = 2$. **(06 Marks)**

OR

4 a. Find the Fourier sine and Cosine transforms of :
$$f(x)=\begin{cases} x & 0<x<2 \\ 0 & \text{elsewhere} \end{cases}.$$ **(08 Marks)**

b. Find the Z – transform of : i) n^2 ii) ne^{-an}. **(06 Marks)**

c. Obtain the inverse Z – transform of $\dfrac{2z^2+3z}{(z+2)(z-4)}$. **(06 Marks)**

Module-3

5 a. Obtain the lines of regression and hence find the co-efficient of correlation for the data :

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

(08 Marks)

b. Fit a parabola $y = ax^2 + bx + c$ in the least square sense for the data :

x	1	2	3	4	5
y	10	12	13	16	19

(06 Marks)

c. Find the root of the equation $xe^x - \cos x = 0$ by Regula – Falsi method correct to three decimal places in (0, 1). **(06 Marks)**

OR

6 a. If $8x - 10y + 66 = 0$ and $40x - 18y = 214$ are the two regression lines, find the mean of x's, mean of y's and the co-efficient of correlation. Find σ_y if $\sigma_x = 3$. **(08 Marks)**

b. Fit an exponential curve of the form $y = ae^{bx}$ by the method of least squares for the data :

No. of petals	5	6	7	8	9	10
No. of flowers	133	55	23	7	2	2

(06 Marks)

c. Using Newton–Raphson method, find the root that lies near $x = 4.5$ of the equation $\tan x = x$ correct to four decimal places. **(06 Marks)**

Module-4

7 a. From the following table find the number of students who have obtained marks :
i) less than 45 ii) between 40 and 45.

Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of students	31	42	51	35	31

(06 Marks)

b. Using Newton's divided difference formula construct an interpolating polynomial for the following data :

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

and hence find f(8). **(08 Marks)**

c. Evaluate $\int_0^1 \dfrac{dx}{1+x}$ taking seven ordinates by applying Simpson's $\frac{3}{8}^{th}$ rule. **(06 Marks)**

OR

8 a. In a table given below, the values of y are consecutive terms of a series of which 23.6 is the 6^{th} term. Find the first and tenth terms of the series by Newton's formulas.

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

(08 Marks)

b. Fit an interpolating polynomial of the form $x = f(y)$ for data and hence find $x(5)$ given :

x	2	10	17
y	1	3	4

(06 Marks)

c. Use Simpson's $\frac{1}{3}^{rd}$ rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking 6 sub-intervals. **(06 Marks)**

Module-5

9 a. Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the closed curve bounded by $y = \sqrt{x}$ and $y = x^2$. **(08 Marks)**

b. Evaluate $\int_C xydx + xy^2dy$ by Stoke's theorem where C is the square in the x – y plane with vertices (1, 0)(–1, 0)(0, 1)(0, –1). **(06 Marks)**

c. Prove that Catenary is the curve which when rotated about a line generates a surface of minimum area. **(06 Marks)**

OR

10 a. If $\vec{F} = 2xy\,\hat{i} + yz^2\,\hat{j} + xz\,\hat{k}$ and S is the rectangular parallelepiped bounded by x = 0, y = 0, z = 0, x = 2, y = 1, z = 3 evaluate $\iint_S \vec{F}\cdot\hat{n}\,ds$. **(08 Marks)**

b. Derive Euler's equation in the standard form viz $\frac{\partial f}{\partial y} - \frac{d}{dx}\left[\frac{\partial f}{\partial y'}\right] = 0$. **(06 Marks)**

c. Find the external of the functional $I = \int_0^{\pi/2} (y^2 - y'^2 - 2y\sin x)dx$ under the end conditions $y(0) = y(\pi/2) = 0$. **(06 Marks)**

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CBCS SCHEME

USN 1KS18ME412 **17MATDIP31**

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Find the modulus and amplitude of $\dfrac{3+i}{2+i}$ **(07 Marks)**

b. If $x = \cos\theta + i\sin\theta$, then show that $\dfrac{x^{2n}-1}{x^{2n}+1} = i\tan n\theta$. **(07 Marks)**

c. Simplify $\dfrac{(\cos 3\theta + i\sin 3\theta)^4(\cos 4\theta + i\sin 4\theta)^5}{(\cos 4\theta + i\sin 4\theta)^3(\cos 5\theta + i\sin 5\theta)^{-4}}$ **(06 Marks)**

OR

2 a. Find the sine of the angle between $\vec{A} = 2\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{B} = 6\hat{i} - 3\hat{j} + 2\hat{k}$. **(07 Marks)**

b. Find the value of λ, so that the vectors $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{c} = \hat{i} + \lambda\hat{k}$ are coplanar. **(07 Marks)**

c. Prove that $\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = 0$. **(06 Marks)**

Module-2

3 a. Find the n^{th} derivative of $e^{ax}\cos(bx + c)$. **(07 Marks)**

b. If $y = a\cos(\log x) + b\sin(\log x)$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$. **(07 Marks)**

c. If $u = \sin^{-1}\left(\dfrac{x^2+y^2}{x+y}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \tan u$. **(06 Marks)**

OR

4 a. Find the pedal equation of $r^n = a^n \cos n\theta$. **(07 Marks)**

b. Expand $\log_e(1 + x)$ in ascending powers of x as for as the term containing x^4. **(07 Marks)**

c. If $x = r\cos\theta$, $y = r\sin\theta$, find $\dfrac{\partial(x,y)}{\partial(r,\theta)}$ **(06 Marks)**

Module-3

5 a. Evaluate $\displaystyle\int_0^1\int_{y^2}^{y}(1 + xy^2)\,dx\,dy$ **(07 Marks)**

b. Evaluate $\displaystyle\int_0^{2\pi}\sin^4 x\cos^6 x\,dx$ **(07 Marks)**

c. Evaluate $\displaystyle\int_0^2 \frac{x^4}{\sqrt{4-x^2}}\,dx$ **(06 Marks)**

OR

6 a. Evaluate $\int_{1}^{2}\int_{3}^{4}\left(xy+e^{y}\right)dydx$ **(07 Marks)**

b. Evaluate $\int_{0}^{\pi} x\sin^{8}x\,dx$ **(07 Marks)**

c. Evaluate $\int_{1}^{2}\int_{0}^{1}\int_{-1}^{1}(x^{2}+y^{2}+z^{2})\,dxdydz$ **(06 Marks)**

Module-4

7 a. If particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$ where t is the time. Find the velocity and acceleration at t = 1. **(07 Marks)**

b. Find the angle between the tangents to the curve $\vec{r} = t^2\hat{i} + 2t\hat{j} - t^3\hat{k}$ at the point $t = \pm 1$. **(07 Marks)**

c. If $\vec{F} = (3x^2y - z)\hat{i} + (xz^3 + y^4)\hat{j} - 2x^3z^2\hat{k}$ find $\text{grad}(\text{div}\,\vec{F})$ at (2, –1, 0). **(06 Marks)**

OR

8 a. Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at (2, –1, 2) along $2\hat{i} - 3\hat{j} + 6\hat{k}$ **(07 Marks)**

b. Find the unit normal to the surface $x^2y + 2xz = 4$ at (2, –2, 3). **(07 Marks)**

c. Show that $\vec{F} = (2xy^2 + yz)\hat{i} + (2x^2y + xz + 2yz^2)\hat{j} + (2y^2z + xy)\hat{k}$ is irrotational. **(06 Marks)**

Module-5

9 a. Solve $\dfrac{dy}{dx} = \sin(x+y)$ **(07 Marks)**

b. Solve $\dfrac{dy}{dx} + y\cot x = \cos x$ **(07 Marks)**

c. Solve $(x - y + 1)dy - (x + y - 1)dx = 0$ **(06 Marks)**

OR

10 a. Solve $\left(1 + e^{x/4}\right)dx + e^{x/y}\left(1 - \dfrac{x}{y}\right)dy = 0$. **(07 Marks)**

b. Solve $\left(x^3\cos^2 y - x\sin 2y\right)dx = dy$. **(07 Marks)**

c. Solve $\left(3x^2y^4 + 2xy\right)dx + \left(2x^3y^3 - x^2\right)dy = 0$ **(06 Marks)**

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CBCS SCHEME

USN 1KS17CS080

17CS/IS32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analog & Digital Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the construction and operation principle of N-channel JFET along with its characteristic curves. **(08 Marks)**

b. The Fig. Q1 (b) shows a biasing configuration using DE-MOSFET. Given that the saturation Drain current is 8 mA and the pinch off voltage is -2 V; determine the value of Gate, source voltage, Drain current and the drain source voltage. **(06 Marks)**

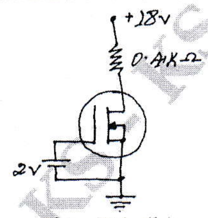

Fig. Q1 (b)

c. With neat figure and relevant waveforms, explain the working of relaxation oscillator circuit using op-amp. **(06 Marks)**

OR

2 a. Explain the working of an Astable multivibrator with necessary diagrams and expressions for frequency of oscillation, using timer IC 555. **(08 Marks)**

b. Differentiate between JFETs and MOSFETs. **(05 Marks)**

c. With neat figure, explain the operation of Peak Detector Circuit using op-amp. **(07 Marks)**

Module-2

3 a. Discuss positive and negative logic and list equivalences in positive and negative logic. **(04 Marks)**

b. A digital system is to be designed in which the months of the year is given as input in four bit form. The month January is represented as '0000', February as '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider excess numbers in the input beyond '1011' as don't care conditions. For this system of four variables (A, B, C, D) find the following:

(i) Boolean expression in $\sum m$ and $\prod M$ form.

(ii) Using K-map simplify in SOP form.

(iii) Implement using NAND-NAND gates. **(08 Marks)**

c. Simplify, using QM method: $F(A,B,C,D) = \sum m(1,2,8,10,11,14,15)$ **(08 Marks)**

OR

4 a. What are static hazards? How to design a hazard free circuit? Explain with an example. **(08 Marks)**

b. Write a verilog code for the Fig. Q4 (b) in, (i) Structural model (ii) Dataflow model and (iii) Behavioural model. **(08 Marks)**

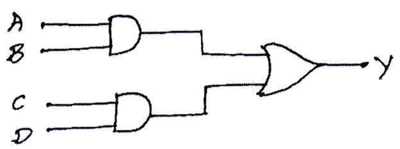

Fig. Q4 (b)

c. Prove that duty cycle of a symmetrical waveform is 50%. An asymmetrical signal waveform is high for 2 ms and low for 3 ms. Find period, frequency and duty cycle high. **(04 Marks)**

Module-3

5 a. Implement $Y(A,B,C,D) = \sum m(0,2,3,4,5,8,9,10,11,12,13,15)$ using 8 to 1 multiplexer. **(06 Marks)**

b. What is magnitude comparator? Write the truth table and logic circuit of a 1 bit comparator. **(06 Marks)**

c. What are different types of PLDs? Implement the 7 segment decoder using PLA. **(08 Marks)**

OR

6 a. Design a priority encoder for a system with three inputs; the middle bit with highest priority encoding to 10, the MSB with next priority encoding to 11, while the LSB with least priority encoding to 01. **(08 Marks)**

b. Write a verilog code for a A-to-1 multiplexer using conditional assignment statement. **(06 Marks)**

c. Differentiate combinational and sequential circuits. **(06 Marks)**

Module-4

7 a. With block diagram, truth table and waveforms, explain the working of Master-Slave JK Flip-Flop. **(07 Marks)**

b. Name and explain in short the four basic types of shift registers and draw a block diagram for each. **(08 Marks)**

c. Bring out the differences between asynchronous and synchronous counters. **(05 Marks)**

OR

8 a. What is switch contact bounce? How to remove any contact bounce due to switch using SR latch. **(08 Marks)**

b. How long it will take to shift the hexadecimal number 'AB' into 54/74164 (SIPO), if the clock is 5 MHz? **(02 Marks)**

c. Explain 4-bit sequence generator and programmable 4-bit sequence detector. **(10 Marks)**

Module-5

9 a. What do you mean by lockout condition in counters? Using JK flip-flops design self correcting mod-6 counter. **(10 Marks)**

b. What is accuracy and resolution of the D/A converter? Explain with example. What is the resolution of a 9-bit D/A converter which uses a ladder network? If the full-scale output voltage of this converter is +5 V, what is resolution in volts? **(10 Marks)**

OR

10 a. Discuss two drawbacks of resistive divider used in converting digital input to analog output. Draw the schematic for a 4-bit binary ladder and explain how digital to analog conversion is achieved using it. **(10 Marks)**

b. Explain the concept of 'successive approximation' of A/D converter. **(10 Marks)**

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CBCS SCHEME

USN | 17CS/IS33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Data Structures & Applications

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Differentiate between Structures and Unions with example. **(05 Marks)**

b. Explain the functions supported by 'C' to carry out dynamic memory allocation. **(05 Marks)**

c. Express the given sparse matrix as triplets and find its transpose and also write a fast transpose algorithm to transpose a sparse matrix

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

(10 Marks)

OR

2 a. How would you represent polynomial using array of structures and also write a function to as 2 polynomials. **(10 Marks)**

b. Find the table and corresponding graph for the second pattern matching algorithm where the pattern is P = ababab. **(10 Marks)**

Module-2

3 a. Convert the following Infix expression to Postfix expression :

(i) ((((a/b) – c) + ((d*e)) – a * c)) (ii) A – B | (C * D $ E) **(06 Marks)**

b. Write a function to evaluate Postfix expression. **(08 Marks)**

c. Define Recursion and Evaluate A(1, 3) using Ackermann's function. **(06 Marks)**

OR

4 a. Explain with suitable example disadvantages of ordinary queue and how it is solved using circular queue, write functions for circular queue insertion and deletion. **(10 Marks)**

b. Define stack. Give 'C' implementation of PUSH and POP functions. Include check for empty and full conditions of stacks. **(06 Marks)**

c. Evaluate the following Postfix expression

623 + – 382 | + * 2 $ 3 + **(04 Marks)**

Module-3

5 a. Write 'C' function to perform the following :

(i) Assume a four node single linked list with data value 15, 25, 40, 50

(ii) Insert a node with data value 30 in between the nodes 25 and 40.

(iii) Delete a mode with data value '40'.

(iv) Search a mode with data value '25' **(15 Marks)**

b. Write a note on linked representation of sparse matrix. Give linked representation of the given sparse matrix $\begin{bmatrix} 0 & 5 & 3 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ **(05 Marks)**

OR

6 a. Write a note on Doubly linked lists and also write functions to insert at front and delete at front using D.L.L. **(08 Marks)**

b. Write a function to add 2 polynomials using Single Linked lists. **(08 Marks)**

c. Write a function to Concatenate 2 Single Linked lists. **(04 Marks)**

Module-4

7 a. With suitable example define the following :
(i) Binary tree (ii) Full binary tree (iii) Almost complete B.T
(iv) Strict Binary tree (v) Level of B.T **(05 Marks)**

b. Create expression tree for the Postfix expression given below.
AB/C*D*E+ and traverse the resulting expression tree using inorder and preorder traversals. **(05 Marks)**

c. Write a note on Threaded Binary tree for a given Binary tree in Fig.Q7(c), Insert 'r' as a right child of 'S' in a Threaded Binary tree and write the function to insert **(10 Marks)**

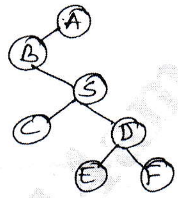

Fig.Q7(c)

OR

8 a. Define BST. Write a function to insert an item into BST. **(10 Marks)**

b. Show that for any non-empty b-tree T, if n_0 is the number of leaf nodes and n_2 is the number of nodes of degree 2 than $n_0 = n_{2+1}$. **(05 Marks)**

c. Write 'C' functions to illustrate copying of binary tree. **(05 Marks)**

Module-5

9 a. Define graph. Give adjacency matrix and adjacency lists for the graph given below Fig.Q9(a) :

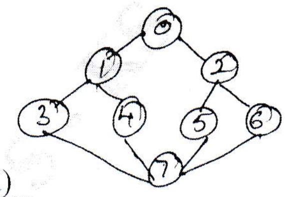

Fig.Q9(a) **(06 Marks)**

b. Write an algorithm for DFS, show BFS and DFS traversals for the graph given in Q.No.9(a). **(10 Marks)**

c. Write a note on Hashing functions. **(04 Marks)**

OR

10 a. What is collision? What are the methods to resolve collision? Explain linear probing with an example. **(10 Marks)**

b. Suppose 9 cards are punched as follows 348, 143, 361, 423, 538, 128, 321, 543, 366. Apply Radix sort to sort them in 3 phases and give its complexity. **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

17CS/IS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. With a neat block diagram discuss the basic operational concept of a computer. **(08 Marks)**
b. What is performance measurement? Explain overall SPEC rating for computer. **(06 Marks)**
c. Explain Big-Endian, Little-Endian and assignment byte addressability. **(06 Marks)**

OR

2 a. What is an addressing mode? Explain any three addressing modes with example. **(08 Marks)**
b. Draw single bus structure, discuss about memory mapped I/O. **(06 Marks)**
c. What is stack and queue? Write the line of code to implement the same. **(06 Marks)**

Module-2

3 a. Define bus arbitration. Briefly explain the two approaches of bus arbitration. **(10 Marks)**
b. Explain the following with respect to USB: i) USB Architecture ii) USB Protocols. **(10 Marks)**

OR

4 a. With a neat block diagram, explain the general 8 bit parallel processing. **(08 Marks)**
b. With a block diagram, explain how the keyboard interfaced to processor. **(06 Marks)**
c. Explain PCI bus. **(06 Marks)**

Module-3

5 a. What is 'Locality of Reference'? Explain Direct mapping technique and set-associative mapping technique. **(10 Marks)**
b. What is asynchronous DRAM? With a neat diagram explain the internal organization of a 2M × 8 dynamic memory chip. **(10 Marks)**

OR

6 a. What is virtual memory? With a diagram explain how virtual memory address translation take place. **(10 Marks)**
b. Write a note on:
i) Magnetic disk principles
ii) Magnetic tape system. **(10 Marks)**

Module-4

7 a. Explain with a neat block diagram, 4-bit carry look ahead adder. **(08 Marks)**
b. Perform following operations on the 5-bit signed numbers using 2's complement representation system. Also indicate whether overflow has occurred.
i) (-9) + (-7) ii) (+7) – (-8). **(04 Marks)**
c. Explain the concept of carry save addition for the multiplication operations, M × Q = P for 4-bit operands with diagram and suitable example. **(08 Marks)**

OR

8 a. With a neat diagram, explain IEEE standard for floating point numbers. **(06 Marks)**

b. Perform multiplication for -13 and +09 using Booth's Algorithm. **(06 Marks)**

c. With a neat block diagram, explain circuit arrangement for binary division. **(08 Marks)**

Module-5

9 a. What is pipelining? Explain the basic concept of pipeline performance with neat sketch. **(08 Marks)**

b. Explain with neat diagram, micro-programmed control method for design of control unit and write the micro-routine for the instruction branch < 0. **(08 Marks)**

c. Differentiate between hardwired and micro programmed control unit. **(04 Marks)**

OR

10 a. Briefly explain the block diagram of camera. **(10 Marks)**

b. With a neat diagram, explain the structure of general purpose multiprocessors. **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | |

17CS/IS35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
UNIX and Shell Programming

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 a figure, the kernel and shell relationship in Unix operating system. **(08 Marks)**
b. Explain with suitable example, options and filenames as arguments. **(06 Marks)**
c. What is the use of following commands : echo, ls, who **(06 Marks)**

OR

2 a. List and explain the salient features of UNIX operating system. **(08 Marks)**
b. List and explain the important sections of man command with suitable example. **(06 Marks)**
c. Explain the use of following commands : printf, passwd, cal **(06 Marks)**

Module-2

3 a. What is a file? Explain the three categories of files in UNIX operating system. **(08 Marks)**
b. Explain the ls command with all the options. **(06 Marks)**
c. Explain the following commands with syntax, option and example : mkdir, rmdir, od mv. **(06 Marks)**

OR

4 a. What is parent child relationship? Explain with a figure, the UNIX file system. **(06 Marks)**
b. Explain the use of chmod command to change file permission using both absolute and relative methods. **(06 Marks)**
c. Explain the following commands with syntax and example : cat rm cp wc **(08 Marks)**

Module-3

5 a. Explain with a figure, the three mode of Vi editor. **(08 Marks)**
b. Explain the various ex mode commands with example. **(06 Marks)**
c. Evaluate the following commands and write the output.
i) ls –l |grep "^d" > file1
ii) grep –v "ZEE" news.txt | wc
iii) grep "8 . . . . $" file1
iv) grep jai sharma emp · lst
v) grep –c member file1
vi) grep ^[^3] filename. **(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

6 a. What are wild cards? Explain the various shell wild cards with suitable example. (08 Marks)
b. Explain the grep command with all the options. (06 Marks)
c. Apply the shell's wild cards and write the output :
i) [a – z] [1 – 4]*·txt
ii) *·[!c] [!p] [!p]
iii) *[0 – 3] [A – Z]
iv) chap* [!0 – 9]
v) chap [0 – 1] [0 – 9]
vi) [A – Z] [a – z] [0 – 9]* (06 Marks)

Module-4

7 a. Explain the sort command with options and example. (06 Marks)
b. Explain the three different forms of if conditional statement. (06 Marks)
c. Write a menu driven shell script to perform the following operations.
i) List of Users ii) Files in a directory
iii) Today's date iv) Count number of files in a directory. (08 Marks)

OR

8 a. What is hard link and soft link? Give differences between them. (04 Marks)
b. Explain the following commands with options and example: head tail cut paste. (08 Marks)
c. Write a menu driven shell script using case statement to perform all arithmetic operations. (08 Marks)

Module-5

9 a. What is a process? Explain the mechanism of process creation. (06 Marks)
b. Explain the following commands with options and example : ps kill at bg. (08 Marks)
c. Write a perl script to check whether the given year is a leap or not. (06 Marks)

OR

10 a. Explain string handling functions in perl. (08 Marks)
b. Explain with example, how the variables are defined and initialized in perl. (06 Marks)
c. Write a perl script to convert the given decimal number into its equivalent binary number. (06 Marks)

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CBCS SCHEME

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17CS/IS36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Define tautology and contradiction. Prove that for any propositions p, q, r the compound proposition $\{p \wedge (p \wedge r) \to s\} \to (r \to s)$ is tautology. **(06 Marks)**

b. Establish the validity of the argument: If A get the superwiser's position and work hard, then he will get raise.
If he gets a raise, then he will buy a new car.
He has not bought a new car.
Therefore, he does not get a superwiser's position or he did not work hard. **(07 Marks)**

c. Determine the truth value of each of the following quantified statements; if the universe being the set of all non-zero integers.
i) $\exists x, \ \exists y\, [xy = 2]$
ii) $\exists x, \forall y\, [xy = 2]$
iii) $\forall x, \exists y\, [xy = 2]$
iv) $\exists x, \exists y, [(3x + y = 8) \wedge (2x - y = 7)]$
v) $\exists x, \exists y\, [(4x + 2y = 3) \wedge (x - y = 1)]$ **(07 Marks)**

OR

2 a. Define dual of a logical statement and prove the logical equivalence using laws of logic $[(\neg p \vee q) \wedge (p \wedge (p \wedge q))] \Leftrightarrow p \wedge q$ **(06 Marks)**

b. Establish the validity of the argument : All Engineering students study physics. All engineering students of computer science study logic.
Ravi is an engineering student who does not study logic
Sachin studies logic but does not study physics.
Therefore, Ravi is not a student of computer science and Sachin is not an engineering student. **(07 Marks)**

c. Give: i) Direct proof ii) Indirect proof and "If n is an odd integer, then n + 7 is an even integer". **(07 Marks)**

Module-2

3 a. Prove that every positive integer greater than or equal to 14 may be written as sum of 3's and /or 8's. **(06 Marks)**

b. Find the number of arrangements of all the letters in TALLAHASSEE. How many of these arrangements have no adjacent A's? **(07 Marks)**

c. In how many ways can one distribute eight identical balls into four distinct containers so that i) No container is left empty ii) the fourth container gets an odd number of balls. **(07 Marks)**

OR

4 a. If L_0, L_1, L_2...... are Lucas numbers, then prove that $L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n + \left(\frac{1-\sqrt{5}}{2}\right)^n$. **(06 Marks)**

b. A question paper contains 10 questions of which 7 are to be answered. In how many ways a student can select the 7 questions
   i) If he can choose any seven?
   ii) If he should select three questions from first five and four questions from the last five?
   iii) If he should select at least three from the first five? **(07 Marks)**

c. Find the coefficient of $x^2y^2z^3$ and the number of distinct terms in the expansion of $(3x - 2y - 4z)^7$. **(07 Marks)**

Module-3

5 a. If f: R → R is defined by $f(x) = x^2 + 5$, find f(-1); f(2/3); $f^{-1}(1)$; $f^{-1}([6, 10])$; $f^{-1}([-4, 5))$; $f^{-1}([-4, 5])$. **(06 Marks)**

b. State Pigeonhole principle. ABC is an equilateral triangle whose sides are of length 3cm each. If we select 10 points inside the triangle, prove that at least two of these points are such that the distance between them is less than 1cm. **(07 Marks)**

c. Let A = {1, 2, 3, 4, 5}. Define a relation R on A × A by $(x_1, y_1)\ R(x_2, y_2)$ if and one if $x_1 + y_1 = x_2 + y_2$. Then verify that R is an equivalence relation on A × A and hence find the equivalence classes [(1, 3)], [(2, 4)] and [(1, 1)]. **(07 Marks)**

OR

6 a. Let A = B = R, the set of all real numbers, and the functions f : A → B and g : B → A be defined by $f(x) = 2x^3 - 1, \forall x \in A$; $g(y) = \left\{\frac{1}{2}(y+1)\right\}^{1/3}, \forall y \in B$. Show that each of f and g is the inverse of the other. **(06 Marks)**

b. Define one-to-one function and on to function. Determine in each of the following cases where f is one-to-one or onto or both or neither [f : A → B].
   i) A = B = {1, 2, 3, 4};
      f = {(1, 1), (2, 3), (3, 4), (4, 2)}
   ii) A = {a, b, c}, B = {1, 2, 3, 4}
      f = {(a, 1), (b, 1), (c, 3)}
   iii) A = {1, 2, 3}, B = {1, 2, 3, 4, 5}
      f = {(1, 1), (2, 3), (3, 4)}
   iv) A = {1, 2, 3}, B = {1, 2, 3, 4, 5}
      f = {(1, 1), (2, 3), (3, 3)}
   v) A = {1, 2, 3, 4}, B = {a, b, c, d}
      f = {(1, a) (2, a), (3, d), (4, c)} **(07 Marks)**

c. Draw Hasse diagram representing the positive divisors of 36. **(07 Marks)**

Module-4

7 a. Determine the number of positive integers n such that $1 \le n \le 300$ and n is not divisible by 5, 6, 8 and divisible by at least one of 5, 6, 8. **(06 Marks)**

b. Four persons P_1, P_2, P_3, P_4 who arrive late for a dinner party, find that only one chair at each of five tables T_1, T_2, T_3, T_4 and T_5 is vacant, P_1 will not sit at T_1 or T_2, P_2 will not sit at T_2, P_3 will not sit at T_3 or T_4 and P_4 will not sit at T_4 or T_5. Find the number of ways they can occupy the vacant chair. **(07 Marks)**

c. Define Homogeneous and non-homogeneous recurrence relations of first order and solve the recurrence relation $a_n - 3a_{n-1} = 5 \times 3^n$ for $n \ge 1$ given that $a_0 = 2$. **(07 Marks)**

OR

8 a. Find the number of nonnegative integer solutions of the equation $x_1 + x_2 + x_3 + x_4 = 18$ under the condition $x_i \leq 7$, for $i = 1, 2, 3, 4$. **(06 Marks)**

b. Define derangements and determine the rook polynomial of the board in Fig.Q.8(b) using expansion formula by selecting square 1 as ⊛ **(07 Marks)**

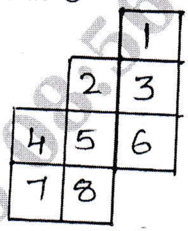

Fig.Q.8(b)

c. Solve the recurrence relation $a_n = a_{n-1} + a_{n-2}$ $a_1 = 1$, $a_2 = 3$. **(07 Marks)**

Module-5

9 a. Define complete graph and complete bipartite graph. Draw Kuratowski's first graph K_5 and second graph $K_{3,3}$ and hence find the number of edges in them. **(06 Marks)**

b. State Handshaking property. Show that $\delta \leq \frac{2m}{n} < \Delta$, for a given graph with n vertices and m edges, if δ is the minimum and Δ is the maximum of the degree of vertices. **(07 Marks)**

c. Obtain an optimal prifix code for the message MISSION SUCCESSFUL. Indicate the code and find the optimal weight. **(07 Marks)**

OR

10 a. Define circuit and Euler circuit in graphs and discuss the solution of Konigsberg bridge problem. **(06 Marks)**

b. Define isomorphism. Verify the two graphs are isomorphic in Fig.Q.10(b). **(07 Marks)**

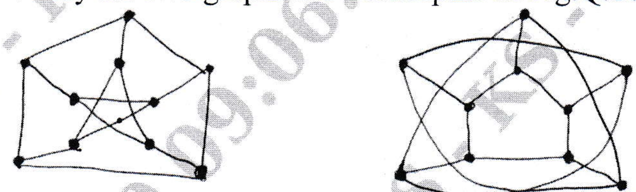

Fig.Q.10(b)

c. Define tree and show that a tree with n vertices has n – 1 edges. **(07 Marks)**

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