CBCS SCHEME

USN | | | | | | | | | | **18MAT31**

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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:

(i) $\left(\frac{4t+5}{e^{2t}}\right)^2$ (ii) $\left(\frac{\sin 2t}{\sqrt{t}}\right)^2$ (iii) $t\cos at$. **(10 Marks)**

b. The square wave function f(t) with period 2a defined by $f(t)=\begin{cases}1 & 0\le t<a\\ -1 & a\le t<2a\end{cases}$. Show that $\left(\frac{1}{s}\right)\tanh\left(\frac{as}{2}\right)$. **(05 Marks)**

c. Employ Laplace transform to solve $\frac{d^2y}{dt^2}-\frac{dy}{dt}=0$, $y(0)=y_1(0)=3$. **(05 Marks)**

OR

2 a. Find (i) $L^{-1}\left\{\frac{s^2-3s+4}{s^3}\right\}$ (ii) $\cot^{-1}\left(\frac{s}{2}\right)$ (iii) $L^{-1}\left\{\frac{s}{(s+2)(s+3)}\right\}$ **(10 Marks)**

b. Find the inverse Laplace transform of, $\frac{1}{s(s^2+1)}$ using convolution theorem. **(05 Marks)**

c. Express $f(t)=\begin{cases}2 & \text{if } 0<t<1\\ \frac{t^2}{2} & \text{if } 1<t<\frac{\pi}{2}\\ \cos t & t>\frac{\pi}{2}\end{cases}$ in terms of unit step function and hence find its Laplace transformation. **(05 Marks)**

Module-2

3 a. Obtain the Fourier series of $f(x)=\begin{cases}2 & -2<x<0\\ x & 0<x<2\end{cases}$. **(08 Marks)**

b. Find the half range cosine series of, $f(x)=(x+1)$ in the interval $0\le x\le 1$. **(06 Marks)**

c. Express $f(x)=x^2$ as a Fourier series of period 2π in the interval $0<x<2\pi$. **(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. Compute the first two harmonics of the Fourier Series of f(x) given the following table :

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

(08 Marks)

b. Find the half range size series of e^x in the interval $0 \le x \le 1$. **(06 Marks)**

c. Obtain the Fourier series of $f(x) = \frac{\pi^2}{12} - \frac{x^2}{4}$ valid in the interval $(-\pi \quad \pi)$ **(06 Marks)**

Module-3

5 a. Find the Infinite Fourier transform of $e^{-|x|}$. **(07 Marks)**

b. Find the Fourier cosine transform of $f(x) = e^{-2x} + 4e^{-3x}$. **(06 Marks)**

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

OR

6 a. If $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$, find the infinite transform of f(x) and hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$. **(07 Marks)**

b. Obtain the Z-transform of $\cosh n\theta$ and $\sinh n\theta$. **(06 Marks)**

c. Find the inverse Z-transform of $\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$ **(07 Marks)**

Module-4

7 a. Solve $\frac{dy}{dx} = e^x - y$, $y(0) = 2$ using Taylor's Series method upto 4^{th} degree terms and find the value of y(1.1). **(07 Marks)**

b. Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} + y = 2x$ at x = 1.1 given $y(1) = 3$ (Take h = 0.1) **(06 Marks)**

c. Apply Milne's predictor-corrector formulae to compute y(0.4) given $\frac{dy}{dx} = 2e^x y$, with **(07 Marks)**

x	0	0.1	0.2	0.3
y	2.4	2.473	3.129	4.059

OR

8 a. Given $\frac{dy}{dx} = x + \sin y$; y(0) = 1. Compute y(0.4) with h = 0.2 using Euler's modified method. **(07 Marks)**

b. Apply Runge-Kutta fourth order method, to find y(0.1) with h = 0.1 given $\frac{dy}{dx} + y + xy^2 = 0$; y(0) = 1. **(06 Marks)**

c. Using Adams-Bashforth method, find y(4.4) given $5x\left(\frac{dy}{dx}\right) + y^2 = 2$ with

x	4	4.1	4.2	4.3
y	1	1.0049	1.0097	1.0143

(07 Marks)

Module-5

9 a. Solve by Runge Kutta method $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for $x = 0.2$ correct 4 decimal places, using initial conditions $y(0) = 1$, $y'(0) = 0$, $h = 0.2$. **(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 extramal of the functional, $\int_{x_1}^{x_2} y^2 + (y')^2 + 2ye^x dx$. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to compute $\frac{d^2y}{dx^2} = 1 + \frac{dy}{dx}$ and the following table of initial values:

x	0	0.1	0.2	0.3
y	1	1.1103	1.2427	1.3990
y′	1	1.2103	1.4427	1.6990

(07 Marks)

b. Find the extramal for the functional, $\int_0^{\frac{\pi}{2}} [y^2 - y'^2 - 2y\sin x]dx$; $y(0) = 0$; $y\left(\frac{\pi}{2}\right) = 1$. **(06 Marks)**

c. Prove that geodesics of a plane surface are straight lines. **(07 Marks)**

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CBCS SCHEME

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18MATDIP31

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.***

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.

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Module-1

1 a. Express the following complex number in the form of $x+iy$: $\frac{(1+i)(1+3i)}{1+5i}$. **(06 Marks)**

b. Prove that $\left(\frac{\cos\theta+i\sin\theta}{\sin\theta+i\cos\theta}\right)^4=\cos 8\theta+i\sin 8\theta$. **(07 Marks)**

c. If $\vec{a}=(3,-1,4)$, $\vec{b}=(1,2,3)$ and $\vec{c}=(4,2,-1)$, find $\vec{a}\times\left(\vec{b}\times\vec{c}\right)$. **(07 Marks)**

OR

2 a. Find the angle between the vectors, $\vec{a}=5\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}-3\hat{j}+6\hat{k}$. **(06 Marks)**

b. Prove that $\left[\vec{a}\times\vec{b},\vec{b}\times\vec{c},\vec{c}\times\vec{a}\right]=\left[\vec{a},\vec{b},\vec{c}\right]^2$ **(07 Marks)**

c. Find the fourth roots of $-1+i\sqrt{3}$ and represent them on the argand diagram. **(07 Marks)**

Module-2

3 a. Obtain the Maclaurin's expansion of $\log_e(1+x)$. **(06 Marks)**

b. If $u=\sin^{-1}\left[\frac{x^3+y^3}{x+y}\right]$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=2\tan u$. **(07 Marks)**

c. If $u=x(1-y)$, $v=xy$, find $\frac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

OR

4 a. Obtain the Maclauvin's series expansion of the function $\log_e \sec x$. **(06 Marks)**

b. If $u=x^2-2y$; $v=x+y$ find $\frac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

c. 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)**

Module-3

5 a. Find the velocity and acceleration of a particle moves along the curve, $\vec{r}=e^{-2t}\hat{i}+2\cos 5t\hat{j}+5\sin 2t\hat{k}$ at any time t. **(06 Marks)**

b. Find $\operatorname{div}\vec{F}$ and $\operatorname{curl}\vec{F}$, where $\vec{F}=\nabla\left(x^3+y^3+z^3-3xyz\right)$. **(07 Marks)**

c. Show that $\vec{F}=(2xy+z^2)\hat{i}+\left(x^2+2yz\right)\hat{j}+\left(y^2+2xz\right)\hat{k}$ is conservative force field and find the scalar potential. **(07 Marks)**

OR

6 a. Show that the vector field, $\vec{F} = (3x+3y+4z)\hat{i} + (x-2y+3z)\hat{j} + (3x+2y-z)\hat{k}$ is solenoidal. **(06 Marks)**

b. Find the directional derivative of $\phi = \frac{xz}{x^2+y^2}$ at (1, −1, 1) in the direction of $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$. **(07 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. **(07 Marks)**

Module-4

7 a. Find the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^3 x^3 y^3 dxdy$. **(07 Marks)**

c. Evaluate $\int_0^3 \int_0^2 \int_0^1 (x+y+z) dzdxdy$. **(07 Marks)**

OR

8 a. Evaluate : $\int_0^{\frac{\pi}{6}} \sin^6(3x) dx$. **(06 Marks)**

b. Evaluate : $\int_0^1 \int_x^{\sqrt{x}} xy\, dydx$. **(07 Marks)**

c. Evaluate : $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz dzdydx$. **(07 Marks)**

Module-5

9 a. Solve : $\frac{dy}{dx} + y\cot x = \sin x$. **(06 Marks)**

b. Solve : $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$. **(07 Marks)**

c. Solve : $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$. **(07 Marks)**

OR

10 a. Solve : $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$. **(06 Marks)**

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

c. Solve : $[1 + (x+y)\tan y]\frac{dy}{dx} + 1 = 0$. **(07 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | | **18CS32**

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

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. What is data structure? What are the various types of data structure? Explain. **(05 Marks)**

b. What is structure? How it is different from array? Explain different types of structure declaration with examples and give differences between Union and Structure. **(10 Marks)**

c. Define pointers. How to declare and initialize pointers, explain with example. **(05 Marks)**

OR

2 a. Explain dynamic memory allocation functions in detail. **(06 Marks)**

b. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text: 'abcxabcdabxabcdabcdabcy' **(08 Marks)**

c. Write a C program to:
(i) Comparing strings
(ii) Concatenate two strings **(06 Marks)**

Module-2

3 a. Define stack. Give the implementation of push, pop and display functions. Include check for empty and full conditions. **(07 Marks)**

b. Write the postfix form of the following expressions using stack:
(i) $A \$ B * C - D + E|F|(G + H)$
(ii) $A - B \mid (C * D \$ E)$ **(06 Marks)**

c. Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression. $ABC - D * + E\$F +$ and assume A = 6, B = 3, C = 2, D = 5, E = 1 and F = 7. **(07 Marks)**

OR

4 a. Define recursion. Write a recursive functions for the following:
(i) Factorial of a number
(ii) Tower of Hanoi **(07 Marks)**

b. What is the advantage of circular queue over ordinary queue? Write a C program to simulate the working of circular queue of integers using array. Provide the following operations:
(i) Insert
(ii) Delete
(iii) Display **(08 Marks)**

c. Write a note on Dequeue and priority queue. **(05 Marks)**

Module-3

5 a. What is a linked list? Explain the different types of linked lists with neat diagram. **(07 Marks)**

b. Write a C function to insert a node at front and delete a node from the rear end in a circular linked list. **(08 Marks)**

c. Write a C function for the concatenation of two doubly linked lists. **(05 Marks)**

OR

6 a. Describe the doubly linked lists with advantages and disadvantages. Write a C function to delete a node from a circular doubly linked list with header node. **(08 Marks)**

b. For the given sparse matrix, give the diagrammatic linked representation.

$$a = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

(04 Marks)

c. Write a C function to add two-polynomials represented as circular list with header node. **(08 Marks)**

Module-4

7 a. What is a tree? With suitable example, define:
(i) Binary tree
(ii) Level of the binary tree
(iii) Complete binary tree
(iv) Degree of the tree **(09 Marks)**

b. Write the C routines to traverse the tree using:
(i) Pre-order traversal
(ii) Post-order traversal. **(06 Marks)**

c. For the given data, draw a binary search tree and show the array and linked representation of the same: 100, 85, 45, 55, 110, 20, 70, 65. **(05 Marks)**

OR

8 a. What is the advantage of the threaded binary tree over binary tree? Explain the construction of threaded binary tree for 10, 20, 30, 40 and 50. **(07 Marks)**

b. Define expression tree. For a tree given in Fig.Q8(b) traverse the tree using in-order, preorder and post-order traversals.

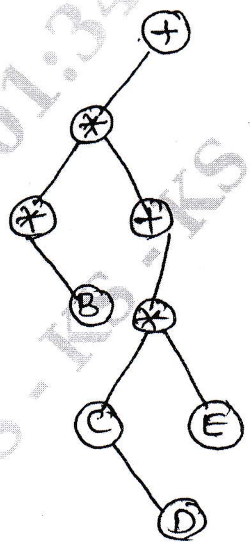

Fig.Q8(b) **(07 Marks)**

c. Construct a binary search tree by using the following in-order and preorder traversals:
Inorder : BCAEDGHFI
Preorder : ABCDEFGHI **(06 Marks)**

Module-5

9 a. Define graph. For the given graph, show the adjacency matrix and adjacency list representation of the graph [Ref. Fig.Q9(a)]

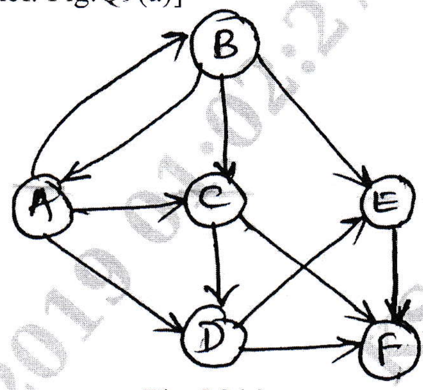

Fig.Q9(a) **(05 Marks)**

b. What are the methods used for traversing a graph? Explain any one with example and write C function for the same. **(08 Marks)**

c. Write a C function for insertion sort. Sort the following list using insertion sort:
50, 30, 10, 70, 40, 20, 60 **(07 Marks)**

OR

10 a. What is collision? What are the methods to resolve collision? Explain linear probing with an example. **(07 Marks)**

b. Explain in detail about static and dynamic hashing. **(06 Marks)**

c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. **(07 Marks)**

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CBCS SCHEME

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18CS33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Explain the construction, working and characteristics of photo diode. **(06 Marks)**

b. With hysteresis characteristics explain the working of Schmitt trigger circuit (Inverting). **(06 Marks)**

c. With a neat circuit diagram and mathematical analysis explain voltage divider bias circuit. **(08 Marks)**

OR

2 a. Explain the working of R-2R ladder D to A converter. **(06 Marks)**

b. Explain successive approximation A to D converter. **(06 Marks)**

c. Show how IC-555 timer can be used as an astable multivibrator. **(08 Marks)**

Module-2

3 a. Find the minimum SOP and minimum POS expressions for the following function using K-map. $f(A, B, C, D) = \sum_m (1, 3, 4, 11) + \sum_d (2, 7, 8, 12, 14, 15)$. **(06 Marks)**

b. What are the disadvantages of K-map method? How they are overcome in Quine Mccluskey method. Simplify following function using Q-M method
$f(A, B, C, D) = \sum_m (0, 1, 2, 5, 6, 7, 8, 9, 10, 14)$. **(08 Marks)**

c. What is Map-Entered Variable method? Using MEV method simplify following function:
$f(A, B, C, D) = \sum_m (2, 3, 4, 5, 13, 15) + dc(8, 9, 10, 11)$. **(06 Marks)**

OR

4 a. With the help of flow chart explain how to determine minimum sum of products using Karnaugh map. **(06 Marks)**

b. Using Q-M method simplify the following function
$F(A, B, C, D) = \sum_m(2, 3, 7, 9, 11, 13) + \sum_d(1, 10, 15)$. **(08 Marks)**

c. With example explain Petrik's method. **(06 Marks)**

Module-3

5 a. What are hazards in digital circuits? Explain different types of hazards. **(06 Marks)**

b. Implement full subtractor using 3 to 8 decoder and NAND gates. **(06 Marks)**

c. Differentiate between PAL and PLA. Realize following functions using PLA. Give PLA table and internal connection diagram for the PLA (Use as many common terms as possible)
$F_1(1, b, c, d) = \sum_m(1, 2, 4, 5, 6, 8, 10, 12, 14)$
$F_2(a, b, c, d) = \sum_m(2, 4, 6, 8, 10, 11, 12, 14, 15)$ **(08 Marks)**

OR

6 a. What is Multiplexer? Implement following function using 8:1 MUX
$f(A, B, C, D) = \sum_m(1, 2, 5, 6, 9, 12)$ **(08 Marks)**

b. Design Hexadecimal (Binary) to ASCII Code Converter using suitable ROM. Give the connection diagram of ROM. **(06 Marks)**

c. Explain Simulation and testing of digital circuits. **(06 Marks)**

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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. Explain the working of SR latch using NOR gates. Show how SR latch can be used for switch debouncing. **(07 Marks)**

c. Differentiate between Latch and Flip Flop. Show how SR flipflop can be converted to D flip flop. **(05 Marks)**

OR

8 a. Derive the characteristics equations for D, T, SR and JK flipflops. **(08 Marks)**

b. Draw the logic diagram of master slave JK flipflop using NAND gates and explain the working with suitable timing diagram. **(07 Marks)**

c. With example explain the syntax of conditional signal assignment statement in VHDL. **(05 Marks)**

Module-5

9 a. What is shift register? Explain the working of 8 bit SISO shift register using SR flip flop. **(06 Marks)**

b. With the help of state graph, state and transition tables and timing diagram explain sequential parity checker. **(06 Marks)**

c. Design a random counter using T flip flops whose transition graph is shown in Fig.Q.9(c). **(08 Marks)**

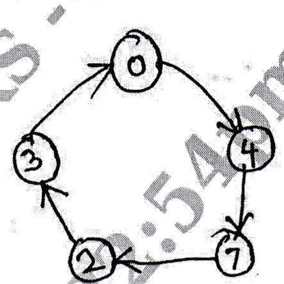

Fig.Q.9(c)

OR

10 a. What is register? Explain how 4 bit register with data, load, clear and clock input is constructed using D flip flops. **(06 Marks)**

b. With a block diagram explain the working of n-bit parallel adder with accumulator. **(06 Marks)**

c. Differentiate between Moore and Melay machines. Analyze following Moore sequential circuit for an input sequence of X = 01101 and draw the timing diagram. **(08 Marks)**

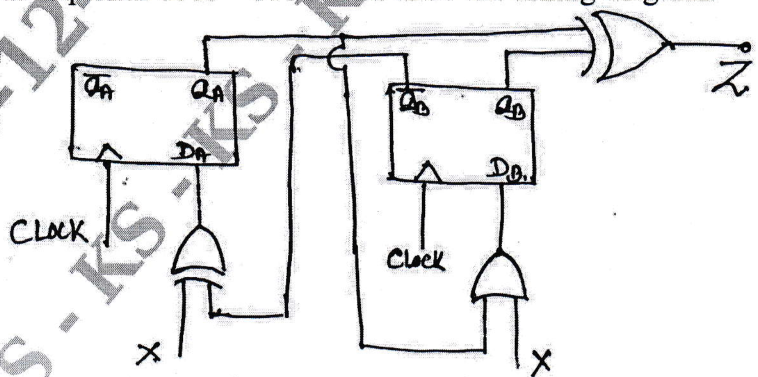

Fig.Q.10(c)

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CBCS SCHEME

USN 1KS18CS126 **18CS34**

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.

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Module-1

1 a. Explain the basic operational concepts of the computer with a neat diagram. **(06 Marks)**

b. What is performance measurement? Explain the overall SPEC rating for the computer in a program suite. **(08 Marks)**

c. Explain the following :
(i) Byte addressability (ii) Big-endian assignment (iii) Little-endian assignment. **(06 Marks)**

OR

2 a. Show how the below expression will be executed in one address, two address and three address processors in an accumulator organization.
$X = A \times B + C \times D$ **(08 Marks)**

b. What is the effective address of the source operand in each of the following instructions, when the Register R1, and R2 of computer contain the decimal value 1200 and 4600?
(i) Load 20(R1), R5 (ii) Move #3000, R5 (iii) Store R5, 30(R1, R2)
(iv) Add – (R2), R5 (v) Subtract (R1)+, R5 **(08 Marks)**

c. Interpret the Subroutine Stack Frame with example. **(04 Marks)**

Module-2

3 a. Illustrate a program that reads one line from the keyboard, stores it in memory buffer, and echoes it back to the display in an I/O interfaces. **(10 Marks)**

b. What is an interrupt? What are Interrupt service routines and what are vectored interrupts? Explain with example. **(10 Marks)**

OR

4 a. Demonstrate the DMA and its implementation and show how the data is transferred between memory and I/O devices using DMA controller. **(08 Marks)**

b. With a neat diagram, explain the general 8-bit parallel interface circuit. **(06 Marks)**

c. Explain PCI bus data transfer in a computer system. **(06 Marks)**

Module-3

5 a. Explain the organization of 1k × 1 memory chip. **(08 Marks)**

b. With a neat figure explain the direct mapped cache in mapping functions. **(08 Marks)**

c. What is memory interleaving? Explain. **(04 Marks)**

OR

6 a. With a neat diagram briefly explain the internal organization of 2M × 8 dynamic memory chip. **(08 Marks)**

b. Illustrate cache mapping techniques. **(06 Marks)**

c. Calculate the average access time experienced by a processor, if a cache hit rate is 0.88, miss penalty is 0.015 milliseconds and cache access time is 10 microseconds. **(06 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.

Module-4

7 a. Perform the addition and subtraction of signed numbers:
(i) + 4 and – 6 (ii) – 5 and – 2 (iii) + 7 and – 3 (iv) + 2 and + 3 **(08 Marks)**

b. Explain 4 bit carry - look ahead adder with a neat diagram. **(06 Marks)**

c. Perform bit pair recoding for (+13) and (– 6). **(06 Marks)**

OR

8 a. Perform Booth's algorithm for signed numbers (– 13) and (+ 11). **(10 Marks)**

b. Show and perform non restoring division for 3 and 8. **(10 Marks)**

Module-5

9 a. Illustrate the sequence of operations required to execute the following instructions
Add (R3), R1 **(10 Marks)**

b. Explain the three bus organization of a data path with a neat diagram. **(10 Marks)**

OR

10 a. Compare and contrast the following :
(i) Hard - wired control
(ii) Microprogrammed control. **(10 Marks)**

b. What is pipeline? Explain the 4 stages pipeline with its instruction execution steps and hardware organization. **(10 Marks)**

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CBCS SCHEME

USN 1KS18CS079

18CS35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Software Engineering

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.

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Module-1

1 a. What is Software Engineering? Explain Software Engineering Code of Ethics. **(08 Marks)**

b. What are attributes of good software? Explain the key challenges facing Software Engineering. **(08 Marks)**

c. Define (i) Feasibility Study (ii) Functional Requirements (iii) Non Functional Requirements (iv) Domain Requirements. **(04 Marks)**

OR

2 a. With a neat block diagram, explain the Spiral Process Model. **(08 Marks)**

b. Explain Requirement Elicitation and Analysis Process. **(08 Marks)**

c. What are the fundamental activities of Software Engineering? **(04 Marks)**

Module-2

3 a. Explain following important terms with example:
(i) Identity (ii) Classification (iii) Inheritance (iv) Polymorphism. **(10 Marks)**

b. Define the purpose of the following terms with suitable example and UML notation with respect to class model
(i) Multiplicity (ii) Association class **(10 Marks)**

OR

4 a. Explain in brief Class Model, State Model and Interaction model. **(10 Marks)**

b. What is Object Oriented Development? Explain different stages of Object Oriented Development. **(10 Marks)**

Module-3

5 a. Explain open source development in detail. **(10 Marks)**

b. Explain Model driven engineering in detail and mention Pros and Cons of it. **(10 Marks)**

OR

6 a. With a neat diagram explain context model, with an example. **(08 Marks)**

b. Explain the phases of Rational Unified Process Model. **(08 Marks)**

c. What is executable UML? Enlist features of executable UML. **(04 Marks)**

Module-4

7 a. With appropriate block diagram, explain the system evolution process. **(08 Marks)**

b. Describe the three types of Software maintenance. Why is it sometimes difficult to distinguish between them? **(08 Marks)**

c. Mention the advantages of Test Driven Development. **(04 Marks)**

OR

8 a. Explain the different levels in Development Testing. **(08 Marks)**
b. Explain the activities involved in Reengineering process with illustrative figures. **(08 Marks)**
c. Explain the four strategic options of Legacy System Management. **(04 Marks)**

Module-5

9 a. List and explain factors affecting software pricing. **(08 Marks)**
b. Mention the two approaches used for estimation techniques and explain algorithmic cost modeling. **(08 Marks)**
c. Bring out the differences between Testing and Inspection. **(04 Marks)**

OR

10 a. Explain plan driven development with a neat block diagram. **(10 Marks)**
b. Explain three Phases in which Review Process is carried out. **(06 Marks)**
c. Mention the differences between Product Standards and Process Standard. **(04 Marks)**

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CBCS SCHEME

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18CS36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks: 100

Note: ***Answer 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.

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Module-1

1 a. Prove that, for any propositions p, q, r the compound proposition $[(p \to q) \wedge (q \to r) \to (p \to r)]$ is a tautology. **(06 Marks)**

b. Test the validity of the following argument.

If I study, I will not fail in the examination.
If I do not watch TV in the evenings, I will study.
I failed in the examination.

$\therefore$ I must have watched TV in the evenings **(07 Marks)**

c. Let $p(x): x^2 - 7x + 10 = 0$, $q(x): x^2 - 2x + 3 = 0$, $r(x): x < 0$. Find the truth or falsity of the following statements, when the universe U contains only the integers 2 and 5,

(i) $\forall x, p(x) \to \sim r(x)$ (ii) $\forall x, q(x) \to r(x)$
(iii) $\exists x, q(x) \to r(x)$ (iv) $\exists x, p(x) \to r(x)$ **(07 Marks)**

OR

2 a. Prove that, for any three propositions p, q, r
$[(p \vee q) \to r] \Leftrightarrow [(p \to r) \wedge (q \to r)]$ **(06 Marks)**

b. Prove that, the following are valid arguments:

(i)
$p \to (q \to r)$
$\sim q \to \sim p$
p

$\therefore r$

(ii)
$\sim p \leftrightarrow q$
$q \to r$
$\sim r$

$\therefore p$

(07 Marks)

c. Give :
(i) a direct proof
(ii) an indirect proof.
(iii) proof by contradiction for the following statement.
"If n is an odd integer, then n+9 is an even integer". **(07 Marks)**

Module-2

3 a. Prove that for each $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{1}{6}n(n+1)(2n+1)$. **(06 Marks)**

b. Determine the coefficient of,
(i) xyz^2 in the expansion of $(2x - y - z)^4$.
(ii) $x^2y^2z^3$ in the expansion of $(3x - 2y - 4z)^7$. **(07 Marks)**

c. A woman has 11 close relatives and she wishes to invite 5 of them to dinner. In how many ways can she invite them in the following situations:
(i) There is no restriction on the choice.
(ii) Two particular persons will not attend separately.
(iii) Two particular persons will not attend together. **(07 Marks)**

OR

4 a. Prove that every positive integer $n \geq 24$ can be written as a sum of 5's and / or 7's. **(06 Marks)**

b. Find the number of permutations of the letters of the word MASSASAUGA. In how many of these all four A's are together? How many of them begin with S? **(07 Marks)**

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

Module-3

5 a. For any non empty sets A, B, C prove that,
(i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
(ii) $(A \times (B - C)) = (A \times B) - (A \times C)$ **(06 Marks)**

b. Let $f : R \to R$ be defined by $f(x) = \begin{cases} 3x - 5 & \text{for } x > 0 \\ -3x + 1 & \text{for } x \leq 0 \end{cases}$.
(i) Determine f(0), $f\left(\frac{5}{3}\right)$ (ii) Find $f^{-1}([-5, 5])$. **(07 Marks)**

c. Let f, g, h be functions form z to z defined by $f(x) = x - 1$, $g(x) = 3x$, $h(x) = \begin{cases} 0 & \text{if } x \text{ is even} \\ 1 & \text{if } x \text{ is odd} \end{cases}$. Verify that $(f \circ g) \circ h(x) = f \circ (g \circ h)(x)$. **(07 Marks)**

OR

6 a. Let $A = \{1, 2, 3, 4, 6\}$ and R be a relation on A defined by aRb if and only if "a is a multiple of b". Represent the relation R as a matrix and draw its diagraph. **(06 Marks)**

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

c. Let $A = \{1, 2, 3, 4, 5\}$, define a relation R on $A \times A$, by $(x_1, y_1) R (x_2, y_2)$ if and only if $x_1 + y_1 = x_2 + y_2$
(i) Verify that R is an equivalence relation.
(ii) Find the partition of $A \times A$ induced by R. **(07 Marks)**

Module-4

7 a. There are eight letters to eight different people to be placed in eight different addressed envelopes. Find the number of ways of doing this so that at least one letter gets to the right person. **(06 Marks)**

b. In how many ways can the 26 letters of the English alphabet be permuted so that none of the patterns CAR, DOG, PUN or BYTE occurs? **(07 Marks)**

c. By using the expansion formula, obtain the rook polynomial for the board C. **(07 Marks)**

		1
	2	3
4	5	6
7	8	

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? **(06 Marks)**

b. If $a_0 = 0$, $a_1 = 1$, $a_2 = 4$ and $a_4 = 37$ satisfy the recurrence relation $a_{n+2} + ba_{n+1} + ca_n = 0$, for $n \geq 0$, find the constants b and c, and solve the relation a_n. **(07 Marks)**

c. How many integers between 1 and 300 (inclusive) are,
(i) Divisible by at least one of 5, 6, 8?
(ii) Divisible by none of 5, 6, 8? **(07 Marks)**

Module-5

9 a. Show that the following two graphs shown in Fig. Q9 (a) – (i) and Fig. Q9 (a) – (ii) are isomorphic, **(06 Marks)**

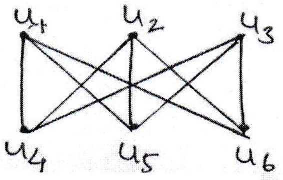

Fig. Q9 (a) – (i)

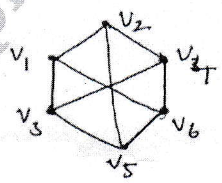

Fig. Q9 (a) – (ii)

b. Define the following with example of each,
(i) Simple graph (ii) Sub graph
(iii) Compliment of a graph (iv) Spanning sub graph **(07 Marks)**

c. Construct an optimal profix code for the symbols a, o, q, u, y, z that occurs with frequencies 20, 28, 4, 17, 12, 7 respectively. **(07 Marks)**

OR

10 a. Prove that two simple graphs G_1 and G_2 are isomorphic if and only if their complements are isomorphic. **(06 Marks)**

b. Let G = (V, E) be a simple graph of order $|V| = n$ and size $|E| = m$, if G is a bipartite graph. Prove that $4m \leq n^2$. **(07 Marks)**

c. Construct an optimal prefix code for the letters of the word ENGINEERING. Hence deduce the code for this word. **(07 Marks)**

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