

INDEX



**MAHARAJA INSTITUTE OF TECHNOLOGY
THANDAVAPURA**

LIBRARY AND INFORMATION CENTRE

VTU Question Papers

Computer Science-III to VIII Semester

July/Aug-2022

2018 Scheme

Maharaja Institute of Technology Thandavapura

**Just of NH-766,Mysore-Ooty highway,Thandavapura(Vill & Post),Nanjangud Taluk,Mysore
District-571302.**

INDEX

Sl. No.	Subject Code	Subject Title	Exam Date
1	18MAT31	Transform calculus ,Fourier series and Numerical Techniques	July/Aug-2022
2	18MATDIP31	Additional mathematics-I	July/Aug-2022
3	18CS32	Data structures and applications	July/Aug-2022
4	18CS33	Analog and digital electronics	July/Aug-2022
5	18CS34	Computer organization	July/Aug-2022
6	18CS35	Software Engineering	July/Aug-2022
7	18CS36	Discrete Mathematical Structures	July/Aug-2022
8	18MAT41	Complex analysis, Probability and statistical methods	July/Aug-2022
9	18MATDIP41	Additional mathematics-II	July/Aug-2022
10	18CS42	Design and analysis of algorithms	July/Aug-2022
11	18CS43	Operating Systems	July/Aug-2022
12	18CS44	Microcontroller and embedded systems	July/Aug-2022
13	18CS45	Object oriented concepts	July/Aug-2022
14	18CS46	Data Communication	July/Aug-2022
15	18CS51	Management & Entrepreneurship for IT Industries	July/Aug-2022
16	18CS53	Database management systems	July/Aug-2022
17	18CS54	Automata theory and computability	July/Aug-2022
18	18CS55	Application development using python	July/Aug-2022
19	18CS56	Unix programming	July/Aug-2022
20	18CS61	System software and compilers	July/Aug-2022
21	18CS62	Computer graphics and visualization	July/Aug-2022
22	18CS63	Web technology and its applications	July/Aug-2022
23	18CS641	Data mining and data warehousing	July/Aug-2022
24	18CS643	Cloud computing and its applications	July/Aug-2022
25	18CS752	Python application programming	July/Aug-2022
26	18CS81	Internet of things	July/Aug-2022
27	18CS822	Storage area networks	July/Aug-2022
28	18CS823	NOSQL Database	July/Aug-2022

GBCS SCHEME

USN

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

18MAT31

Third Semester B.E. Degree Examination, July/August 2022 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,
(i) $e^{-2t}(2\cos 5t - \sin 5t)$ (ii) $\cosh^2 3t$ (06 Marks)
- b. Find the Laplace transform of the full wave rectifier $f(t) = E \sin \omega t$ $0 < t < \frac{\pi}{\omega}$ having a period $\frac{\pi}{\omega}$. (07 Marks)
- c. Find the inverse Laplace transform $\left[\frac{s^2 + 4}{s(s+4)(s-4)} \right]$. (07 Marks)

OR

- 2 a. Find the Laplace transform, $\frac{\cos at - \cos bt}{t}$. (06 Marks)
- b. Solve by using Laplace transform method $y'''(t) + 2y''(t) - y'(t) - 2y(t) = 0$, given $y(0) = y'(0) = 0$ and $y''(0) = 6$ (07 Marks)
- c. Express the function $f(t)$ in terms of unit step function and hence find its inverse LT,
$$f(t) = \begin{cases} \cos t & 0 < t \leq \pi \\ 1 & \pi < t \leq 2\pi \\ \sin t & t > 2\pi \end{cases}$$
 (07 Marks)

Module-2

- 3 a. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$, in $0 < x < 2\pi$. Hence deduce that
 $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$. (06 Marks)
- b. Show that the sine half range series for the function, $f(x) = Lx - x^2$, in $0 < x < L$ is
 $\frac{8L^2}{\pi^3} \sum_0^\infty \frac{1}{(2n+1)^3} \sin\left(\frac{2n+1}{L}\pi x\right)$. (07 Marks)
- c. Obtain the Fourier series of y up to the first harmonics for the following values :

x°	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.6	3.4

(07 Marks)

OR

- 4 a. Expand the function $f(x) = x \sin x$, as a Fourier series in the interval $-\pi \leq x \leq \pi$. Deduce that $\frac{1}{1,3} - \frac{1}{3,5} + \frac{1}{5,7} \dots = \frac{\pi-2}{4}$ (06 Marks)
- b. Obtain the half range cosine series of $f(x) = x \sin x$ $0 \leq x \leq \pi$. (07 Marks)
- c. Obtain the constant term and the first three coefficients in the Fourier cosine series for y using the following data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(07 Marks)

Module-3

- 5 a. Find the complex Fourier transform of the function, $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$.

Hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$. (06 Marks)

- b. If $\overline{f(z)} = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 (07 Marks)
- c. Solve by using z-transforms, $u_{n+2} + 5u_{n+1} + 6u_n = 2^n$; $u_1 = 0, u_0 = 0$ (07 Marks)

OR

- 6 a. Find the Fourier sine transform of e^{-ax} , $a > 0$. (06 Marks)
- b. Find the Fourier sine and cosine transform of $2e^{-3x} + 3e^{-2x}$. (07 Marks)
- c. Solve by using Z-transforms, $y_{n+2} + 2y_{n+1} + y_n = n$, with $y(0) = 0 = y$ (07 Marks)

Module-4

- 7 a. Use Taylor's series method to find $y(4.1)$ given that $\frac{dy}{dx} = \frac{1}{x^2 + y}$ and $y(4) = 4$. (06 Marks)
- b. Use Fourth order Runge-Kutta method to solve $(x+y)\frac{dy}{dx} = 1$, $y(0.4) = 1$ at $x = 0.5$. Correct to four decimal places. (07 Marks)
- c. The following table gives the solution of $5xy^1 + y^2 - 2 = 0$, find the value of y at $x = 4.5$ using Milne's Predictor and Corrector formulae, use the corrector formulae twice.

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

(07 Marks)

OR

- 8 a. Using modified Euler's method find y at $x = 0.2$ given $\frac{dy}{dx} = 3x + \frac{y}{2}$, with $y(0) = 1$ taking $h = 0.1$. (06 Marks)
- b. Using Runge-Kutta method of fourth order find $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ taking $h = 0.2$ (07 Marks)
- c. Apply Adams-Bashforth method to solve the equation $(y^2 + 1)dy - x^2 dx = 0$, at $x = 1$, given $y(0) = 1, y(0.25) = 1.0026, y(0.5) = 1.0206, y(0.75) = 1.0679$. Apply the corrector formulae twice. (07 Marks)

Module-5

- 9 a. Given $\frac{d^2y}{dx^2} - x^2 \frac{dy}{dx} - 2xy = 1$, $y(0) = 1$, $y'(0) = 0$, Evaluate $y(0.1)$ using Runge-Kutta method of order 4. (06 Marks)
- b. A necessary condition for the integral $I = \int_{x_1}^{x_2} f(x, y, y') dx$ where $y(x_1) = y_1$ and $y(x_2) = y_2$ to be extremum that $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y'} \right) = 0$. (07 Marks)
- c. Show that the extremal of the functional $\int_0^1 y^2 \{3x(y'^2 - 1) + yy'^3\} dx$, subject to the conditions $y(0) = 0$, $y(1) = 2$, is the circle $x^2 + y^2 - 5x = 0$. (07 Marks)

OR

- 10 a. Apply Milne's method to compute $y(0.8)$. Given that $\frac{d^2y}{dx^2} = 1 - 2y \frac{dy}{dx}$ and the following table of initial values. (06 Marks)

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

- b. Find the extremal of the functional $\int_a^b (x^2 y'^2 + 2y^2 + 2xy) dx$. (07 Marks)
- c. Prove that Geodesics on a plane are straight line. (07 Marks)

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

Third Semester B.E. Degree Examination, July/August 2022 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 $\frac{(3+i)(1-3i)}{(2+i)}$ in the form $x + iy$. (06 Marks)
- b. If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$. Find the value of 'ρ' such that $\vec{a} - \rho\vec{b}$ is perpendicular to \vec{c} . (07 Marks)
- c. Find the angle between the vector $\vec{a} = 5\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 6\hat{k}$. (07 Marks)

OR

- 2 a. Find the modulus and amplitude of the complex number $1 + \cos\alpha + i \sin\alpha$. (06 Marks)
- b. Prove that $\left(\frac{1 + \cos\theta + i \sin\theta}{1 + \cos\theta - i \sin\theta}\right)^n = \cos n\theta + i \sin n\theta$. (07 Marks)
- c. Find the sine of the angle between $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$. (07 Marks)

Module-2

- 3 a. Find the n^{th} derivative of $\cos x \cos 2x$. (06 Marks)
- b. Obtain the Maclaurin's series expansion of the function $\sqrt{1 + \sin 2x}$ upto the term containing x^4 . (07 Marks)
- c. If $u = f(y - z, z - x, x - y)$ prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. (07 Marks)

OR

- 4 a. If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$. (06 Marks)
- b. If $z = xy^2 + x^2y$ where $x = at^2$ and $y = 2at$. Find $\frac{dz}{dt}$. (07 Marks)
- c. If $x = e^u \sec v$, $y = e^u \tan v$. Find $J\left(\frac{x, y}{u, v}\right)$. (07 Marks)

Module-3

- 5 a. A particle moves along the curve $\vec{r} = \cos 2t\hat{i} + \sin 2t\hat{j} + t\hat{k}$ where t is the time variable. Determine the components of velocity and acceleration vectors at $t = \pi/8$ in the direction of $\sqrt{2}\hat{i} + \sqrt{2}\hat{j} + \hat{k}$. (06 Marks)
- b. Find $\text{div } \vec{f}$ for $\vec{f} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. (07 Marks)
- c. Show that $\vec{f} = (2xy + z^2)\hat{i} + (x^2 + 2yz)\hat{j} + (y^2 + 2xz)\hat{k}$ is irrotational and find ϕ such that $\vec{f} = \nabla\phi$. (07 Marks)

OR

- 6 a. Find the unit normal to the surface $x^3y^3z^2 = 4$ at the point $P(-1, -1, 2)$. (06 Marks)
- b. If $\vec{f} = 2x^2\hat{i} - 3yz\hat{j} + xz^2\hat{k}$ and $\phi = 2z - x^3y$, find $\vec{f} \cdot (\nabla\phi)$ and $\vec{f} \times (\nabla\phi)$ at $(1, -1, 1)$. (07 Marks)
- c. Show that $\vec{f} = \frac{x\hat{i} + y\hat{j}}{x^2 + y^2}$ is both solenoidal and irrotational. (07 Marks)

Module-4

- 7 a. Obtain a reduction formula for $\int_0^{\pi/2} \sin^n x \, dx$ ($n > 0$). (06 Marks)
- b. Evaluate $\int_0^{2a} x^2 \sqrt{2ax - x^2} \, dx$. (07 Marks)
- c. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz \, dz \, dy \, dx$. (07 Marks)

OR

- 8 a. Obtain a reduction formula for $\int_0^{\pi/2} \cos^n x \, dx$ ($n > 0$). (06 Marks)
- b. Evaluate $\iint_R xy \, dx \, dy$ where R is the first quadrant of the circle $x^2 + y^2 = a^2$, $x \geq 0$, $y \geq 0$. (07 Marks)
- c. Evaluate $\int_{-1}^1 \int_0^{x+z} \int_{x-z}^{x+z} (x + y + z) \, dy \, dx \, dz$. (07 Marks)

Module-5

- 9 a. Solve $x^2 \frac{dy}{dx} - 2xy - x + 1 = 0$. (06 Marks)
- b. Solve $(3x^2y^2 + x^2)dx + (2x^3y + y^2)dy = 0$. (07 Marks)
- c. Solve $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$. (07 Marks)

OR

- 10 a. Solve $\left[y \left(1 + \frac{1}{x} \right) + \cos y \right] dx + [x + \log x - x \sin y] dy = 0$. (06 Marks)
- b. Solve $\frac{dy}{dx} + y \cot x = \sin x$. (07 Marks)
- c. Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x$. (07 Marks)

* * * * *

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

Third Semester B.E. Degree Examination, July/August 2022 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define data structures. Explain the classification of data structures with examples. (06 Marks)
- b. Explain the dynamic memory allocation functions supported by 'C' with syntax and examples. (06 Marks)
- c. Consider the pattern P = ababab. Construct the table and the corresponding labeled directed graph used in the fast or second pattern matching algorithm. Trace it for the input text T = abaabababba. (08 Marks)

OR

- 2 a. Differentiate between structures and unions. Show examples for both. (06 Marks)
- b. Explain any four string handling functions supported by 'C' with syntax and examples. (06 Marks)
- c. Explain the representation of linear arrays in memory. Also, consider the linear arrays AAA (5:50) and BBB(-5:10).
- i) Find the number of elements in each array.
- ii) Suppose Base (AAA) = 300, Base (BBB) = 500 and 4 words per memory cell for AAA, 2 words per memory cell for BBB, find the address of AAA[15], AAA[55], BBB[8] and BBB[0]. (08 Marks)

Module-2

- 3 a. Define a stack. Explain the different operations that can be performed on stacks with suitable 'C' functions and examples. (07 Marks)
- b. Convert the following infix expression into postfix expression using stack.
A + (B * C - (D / E ^ F) * G) * H. (05 Marks)
- c. Develop a C recursive program for tower of Hanoi problem. Trace it for 3 disks with schematic call tree diagram. (08 Marks)

OR

- 4 a. Develop C functions to implement insertion, deletion and display operations of a circular queue. (07 Marks)
- b. Write an algorithm to evaluate a postfix expression. Trace the algorithm for the following expression showing the stack contents 6 5 1 = 4 * 23 ^ / +. (06 Marks)
- c. Define Ackermann function recursively and evaluate A(3, 0). Also, develop C code for the same. (07 Marks)

Module-3

- 5 a. Write the differences between arrays and linked lists. (04 Marks)
- b. Develop C functions to implement the following in a singly linked list:
- i) Delete a node from the front ii) Concatenate two linked lists. (08 Marks)
- c. Develop a C function to add two polynomials using singly linked list. (08 Marks)

OR

- 6 a. Show the diagrammatic linked representation for the following sparse matrix:

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

(04 Marks)

- b. Develop C functions to implement the following in a doubly linked list:
- Insert a node at the front
 - Delete a node from the end.
- (08 Marks)
- c. Develop C functions to implement the various operations of queues using linked list. (08 Marks)

Module-4

- 7 a. With suitable examples, define the following:
- Degree of a node
 - Level of a binary tree
 - Complete binary tree
 - Full binary tree.
- (06 Marks)
- b. Construct binary search tree for the given set of values 14, 15, 4, 9, 7, 18, 3, 5, 16, 20. Also, perform inorder, preorder and postorder traversals of the obtained tree. (06 Marks)
- c. Explain threaded binary trees and their representation with a neat diagram. Also, develop a C function to do the inorder traversal of a threaded binary tree. (08 Marks)

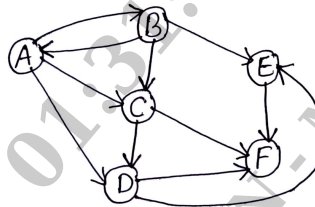
OR

- 8 a. Explain the array and linked representation of binary trees with suitable examples. (06 Marks)
- b. A binary tree has 9 nodes. The inorder and preorder traversals yield the following sequences of nodes:
Inorder: E A C K F H D B G
Preorder: F A E K C D H G B
Draw the binary tree. Also, perform the post order traversal of the obtained tree. (06 Marks)
- c. Develop C functions to implement the following:
- Search a key value in a binary search tree
 - Copying a binary tree.
- (08 Marks)

Module-5

- 9 a. Define a graph. For the graph shown in Fig.Q.9(a), show the adjacency matrix and adjacency list representations. (06 Marks)

Fig.Q.9(a)

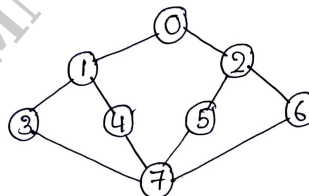


- b. Suppose an array contains 8 elements as follows: 77, 33, 44, 11, 88, 22, 66, 55. Sort the array using insertion sort algorithm. (06 Marks)
- c. What is hashing? Explain the following hash functions with proper examples:
- Division
 - Midsquare
 - Folding.
- (08 Marks)

OR

- 10 a. Briefly explain Breadth-First Search (BFS) and Depth-First Search (DFS) traversal of a graph. Also, show the BFS and DFS traversals for the following graph in Fig.Q.10(a).

Fig.Q.10(a)



- (06 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. (06 Marks)
- c. What is Collision? Explain the collision resolution techniques with proper examples. (08 Marks)

* * * * *

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

Third Semester B.E. Degree Examination, July/August 2022 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 working principal of photodiode and discuss its applications. (08 Marks)
- b. Design a monostable multivibrator circuit using 555 Timer IC to generate an output pulse of 100 ms. Choose $C = 0.47 \mu\text{F}$. Draw the circuit. (06 Marks)
- c. Give the typical application of A/D and D/A converters with a block diagram. (06 Marks)

OR

- 2 a. Obtain the expression for collector to emitter voltage for voltage divider bias of BJT using accurate analysis. (08 Marks)
- b. Design and draw astable multivibrator circuit using 555 Timer IC to generate 1 kHz square wave (Duty cycle = 50 %). Assume $C = 0.1 \mu\text{F}$. (06 Marks)
- c. Explain R-2R ladder type DAC with a neat diagram. (06 Marks)

Module-2

- 3 a. Define prime implicant and essential prime implicant. Give an example. (04 Marks)
- b. Use a Karnaugh map to find the minimum sum-of-products form for,

$$F(A, B, C, D) = \sum m(0, 2, 4, 10, 11, 14, 15) + \sum d(6, 7)$$
(06 Marks)
- c. Find a minimum sum-of-products solution using the Quine-McClusky method for given function,

$$f(w, x, y, z) = \sum m(1, 3, 6, 7, 8, 9, 10, 12, 13, 14)$$
(10 Marks)

OR

- 4 a. Obtain the minimum product of sums for $f(w, x, y, z) = \bar{x}\bar{z} + wyz + \bar{w}\bar{y}\bar{z} + \bar{x}y$ using Karnaugh map. (08 Marks)
- b. Find all prime implicants of the given function $F = \sum m(0, 1, 2, 5, 6, 7)$, and find all minimal solutions using Petrick's method. (08 Marks)
- c. Explain simplification of logic functions using map-entered variables. (04 Marks)

Module-3

- 5 a. Realize the given function $f = bc + \bar{a}\bar{b} + \bar{a}b$ using only two-input NAND gates. (06 Marks)
- b. Discuss different types of hazards in combinational logic circuits. (06 Marks)
- c. What is Programmable Array Logic (PAL)? Show the implementation of a full adder using a PAL. (08 Marks)

OR

- 6 a. What is a multiplexer? Write the logic diagram for 8 : 1 multiplexer using 4 input AND and OR gates. (08 Marks)
- b. Discuss the four kinds of three state buffers. (08 Marks)
- c. Explain programmable logic array structure. (04 Marks)

Module-4

- 7 a. What is VHDL? Show how to model the 4-to-1 multiplexer using a VHDL conditional assignment statement. (06 Marks)
- b. Derive the characteristic equation for S-R flip-flop and J-K flip-flop in product-of-sums form. (06 Marks)
- c. What is D flip-flop? Illustrate the operation of the clear and preset inputs in D-flip-flop with timing diagram. (08 Marks)

OR

- 8 a. Show how to construct a VHDL module using an entity architecture pair. (06 Marks)
- b. Explain switch debouncing with an S-R latch. (06 Marks)
- c. What is T flip-flop? Show how to convert D-flip-flop into T-flip-flop. (08 Marks)

Module-5

- 9 a. What is a register? Build a parallel adder with an accumulator using registers. (06 Marks)
- b. Design 3-bit synchronous counter using T-flip-flops. (08 Marks)
- c. Design a sequential parity checker for serial data. (06 Marks)

OR

- 10 a. Explain the working of a 3 bit shift register. (06 Marks)
- b. Distinguish ring counter and Johnson counter. Also give the general form of a shift register counter. (06 Marks)
- c. Design 3-bit binary synchronous down counter using J-K flip-flops. (08 Marks)

* * * * *

GBCS SCHEME

USN

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

18CS34

Third Semester B.E. Degree Examination, July/August 2022 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 neat diagram, explain the basic operational concepts of computer. (10 Marks)
b. Explain:
(i) Processor clock
(ii) Clock rate
(iii) Basic performance equation
(iv) Performance measurement (10 Marks)

OR

- 2 a. Explain all addressing modes with assembler syntax. (10 Marks)
b. State and explain the possibilities of encoding of machine instruction of 32 bit word. (10 Marks)

Module-2

- 3 a. Explain interrupt and interrupt hardware. State steps in enabling and disabling interrupts. (10 Marks)
b. Explain interrupt nesting and handling simultaneous requests in interrupts. (10 Marks)

OR

- 4 a. Explain DMA transfer with bus arbitration. (10 Marks)
b. Explain USB tree structure and protocols. (10 Marks)

Module-3

- 5 a. Draw the internal organization of a $2M \times 8$ dynamic memory chip and explain working with fast page mode. (10 Marks)
b. State and explain the types of read only memory and memory hierarchy. (10 Marks)

OR

- 6 a. What is cache memory? Explain different mapping functions with diagrams. (10 Marks)
b. Explain memory interleaving with diagram. State hit rate and miss penalty. (10 Marks)

Module-4

- 7 a. Explain different types of number representations with example and draw the addition/subtraction logic unit. (10 Marks)
b. Design and explain the 4-bit carry look-ahead adder. (10 Marks)

OR

- 8 a. Explain Booth algorithm. Perform $(+13) \times (-6)$ using Booth algorithm. (10 Marks)
b. Draw the circuit arrangement for binary division. Perform $(1000) \div (11)$ using restoring division. (10 Marks)

Module-5

- 9 a. With neat diagram, explain single-bus organization of computer and fundamental concepts. (10 Marks)
- b. State the steps required in execution of Add (R_3), R_1 , and explain the execution of branch instruction. (10 Marks)
- OR**
- 10 a. Explain the information required to generate control signals and structure of micro programmed control unit. (10 Marks)
- b. Explain basic idea of pipe lining and 4-stage pipeline structure. (10 Marks)

CBCS SCHEME

USN

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

18CS35

Third Semester B.E. Degree Examination, July/August 2022 Software Engineering

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. What is software engineering and why it is important? Explain software engineering ethics. (10 Marks)
- b. With a neat block diagram, explain the requirement elicitation and analysis process. (06 Marks)
- c. What is requirement validation? Explain the different types of checks carried out during the process. (04 Marks)

OR

- 2 a. What do you mean by software design and implementation? With neat block diagram, explain the general model of the design process. (10 Marks)
- b. Write note on the following:
 - (i) Non-functional requirements with example. (10 Marks)
 - (ii) Notations used for writing system requirements. (10 Marks)

Module-2

- 3 a. What a Object Oriented Development? Explain the different stages of object oriented development. (10 Marks)
- b. Write note on the following:
 - (i) Association End Names. (10 Marks)
 - (ii) Purposes of Model. (10 Marks)

OR

- 4 a. Write note on :
 - (i) OO Themes (10 Marks)
 - (ii) The Three models. (10 Marks)
- b. Describe the various OCL (Object Constraint Language) constructs for traversing class models with example. (10 Marks)

Module-3

- 5 a. Describe Event-driven model with a state diagram of microwave oven application. (10 Marks)
- b. What do you mean by design pattern? Explain the essential elements of design pattern. (10 Marks)

OR

- 6 a. Describe the three main aspects of implementation important to software engineering. (10 Marks)
- b. Describe interaction models with example. (10 Marks)

Module-4

- 7 a. Describe the three different types of user testing. (10 Marks)
- b. Explain software reengineering process with a neat block diagram. (10 Marks)

OR

- 8 a. Describe the Lehman's laws of program evolution dynamics. (10 Marks)
b. Discuss the following with respect to Legacy system management :
(i) Strategic options
(ii) Clusters of system. (10 Marks)

Module-5

- 9 a. Describe the following with respect to project plan development :
(i) Sections of project plan. (10 Marks)
(ii) Project scheduling. (10 Marks)
b. Discuss the software review process and inspections of quality assurance. (10 Marks)

OR

- 10 a. Describe the key stages in the process of product measurement. Also briefly explain the factors affecting software pricing. (10 Marks)
b. Write note on the following:
(i) Static software product metrics.
(ii) Algorithmic cost modeling. (10 Marks)

* * * * *

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

Third Semester B.E. Degree Examination, July/August 2022 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. Prove that for any propositions p, q, r the compound proposition : $\{p \rightarrow (q \rightarrow r)\} \rightarrow \{(p \rightarrow q) \rightarrow (p \rightarrow r)\}$ is a tautology. (06 Marks)
- b. Test the validity of the arguments using rules of inference.
- $$\begin{array}{l} (\neg p \vee q) \rightarrow r \\ r \rightarrow s \vee t \\ \neg s \wedge \neg u \\ \neg u \rightarrow \neg t \\ \hline \therefore p \end{array}$$
- (06 Marks)
- c. Give an indirect proof and proof by contradiction for, "If m is an even integer, then $m + 7$ is odd". (08 Marks)

OR

- 2 a. Prove the following logical equivalences using laws of logic: $[\neg p \wedge (\neg q \wedge r)] \vee [(q \wedge r) \vee (p \wedge r)] \Leftrightarrow r$ (06 Marks)
- b. Consider the following open statements with the set of all real numbers as the universe:
 $p(x) : x \geq 0, q(x) : x^2 \geq 0, r(x) : x^2 - 3x - 4 = 0$
 $s(x) : x^2 - 3 > 0$. Determine the truth values of the following statements.
- (i) $\exists x, p(x) \wedge q(x)$
 - (ii) $\forall x, p(x) \rightarrow q(x)$
 - (iii) $\forall x, q(x) \rightarrow s(x)$
 - (iv) $\forall x, r(x) \vee s(x)$
 - (v) $\exists x, p(x) \wedge r(x)$
 - (vi) $\forall x, r(x) \rightarrow p(x)$ (06 Marks)
- c. Establish the validity of the following :
- $$\begin{array}{l} \forall x, [p(x) \vee q(x)] \\ \exists x, \neg p(x) \\ \forall x, [\neg q(x) \vee r(x)] \\ \forall x, [s(x) \rightarrow \neg r(x)] \\ \hline \therefore \exists x, \neg s(x) \end{array}$$
- (08 Marks)

Module-2

- 3 a. Prove by mathematical induction $4n < (n^2 - 7)$ for all positive integers $n \geq 6$. (06 Marks)
- b. A certain question paper contains two parts A and B each containing 4 questions. How many different ways a student can answer 5 questions by selecting atleast 2 questions from each part? (06 Marks)
- c. Determine the coefficient of,
- (i) xyz^2 in $(2x - y - z)^4$
 - (ii) x^9y^3 in the expansion of $(2x - 3y)^{12}$. (08 Marks)

OR

- 4 a. Prove by mathematical induction, $1.3 + 2.4 + 3.5 + \dots + n(n+2) = \frac{n(n+1)(2n+7)}{6}$. (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? (06 Marks)
- c. In how many ways can we distribute eight identical white balls into four distinct containers so that,
- no container is left empty?
 - the fourth container has an odd number of balls in it? (08 Marks)

Module-3

- 5 a. State pigeonhole principle. ABC is an equilateral triangle whose sides are of length 1 cm each. If we select 5 points inside the triangle, prove that atleast two of these points are such that the distance between them is less than $\frac{1}{2}$ cm. (08 Marks)
- b. If $A = A_1 \cup A_2 \cup A_3$ where $A_1 = \{1,2\}$, $A_2 = \{2,3,4\}$ and $A_3 = \{5\}$, define a relation R on A by xRy if x and y are in the same subset A_i for $1 \leq i \leq 3$. Is R an equivalence relation. (06 Marks)
- c. Let $f, g: \mathbb{R} \rightarrow \mathbb{R}$ where $f(x) = ax+b$ and $g(x) = 1-x+x^2$. If $(g \circ f)(x) = 9x^2 - 9x + 3$ determine a, b. (06 Marks)

OR

- 6 a. Prove that if $f: A \rightarrow B$, $g: B \rightarrow C$ are invertible functions, then $g \circ f: A \rightarrow C$ is invertible and $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$. (06 Marks)
- b. For $A = \{a, b, c, d, e\}$ the Hasse diagram for the poset (A, R) is shown in Fig. Q6 (b).
- Determine the relation matrix for R.
 - Construct the directed graph G that is associated with R. (06 Marks)

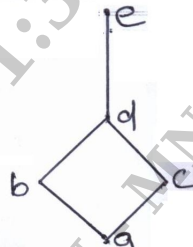


Fig. Q6 (b)

- c. If R is an equivalence relation on a set A and $x, y \in A$ then prove
- $x \in [x]$
 - xRy if and only if $[x] = [y]$ and
 - if $[x] \cap [y] \neq \emptyset$ then $[x] = [y]$. (08 Marks)

Module-4

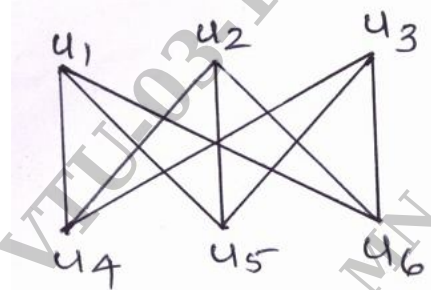
- 7 a. Find the number of permutations of a, b, c, ..., x, y, z in which none of the patterns spin, game, path or net occurs. (08 Marks)
- b. For the positive integers 1, 2, 3, ..., n there are 11660 derangements where 1, 2, 3, 4 and 5 appear in the first five positions. What is the value of n? (06 Marks)
- c. Solve the recurrence relation $a_n + a_{n-1} - 6a_{n-2} = 0$ where $n \geq 2$ and $a_0 = -1$, $a_1 = 8$. (06 Marks)

OR

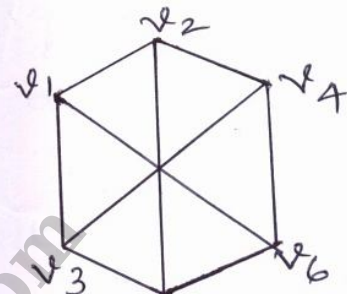
- 8 a. Determine the number of integers between 1 and 300 (inclusive) which are, (i) divisible by exactly two of 5, 6, 8 (ii) divisible by atleast two of 5, 6, 8. **(06 Marks)**
- b. Describe the expansion formula for Rook polynomials. Find the Rook polynomial for 3×3 board using expansion formula. **(08 Marks)**
- c. The number of bacteria in a culture is 1000 (approximately) and this number increases 250% every two hours. Use a recurrence relation to determine the number of bacteria present after one day. **(06 Marks)**

Module-5

- 9 a. Define with examples, (i) Subgraph, (ii) Spanning subgraph (iii) Complete graph (iv) Induced subgraph (v) Complement of a graph (vi) path. **(06 Marks)**
- b. Merge sort the list, $-1, 7, 4, 11, 5, -8, 15, -3, -2, 6, 10, 3$ **(06 Marks)**
- c. Define isomorphism of two graphs. Determine whether the following graphs G_1 and G_2 are isomorphic or not.



G_1
Fig. Q9 (c) - i



G_2
Fig. Q9 (c) - ii

(08 Marks)

OR

- 10 a. Let $G = (V, E)$ be the undirected graph in Fig. Q10 (a). How many paths are there in G from a to h ? How many of these paths have length 5? **(06 Marks)**

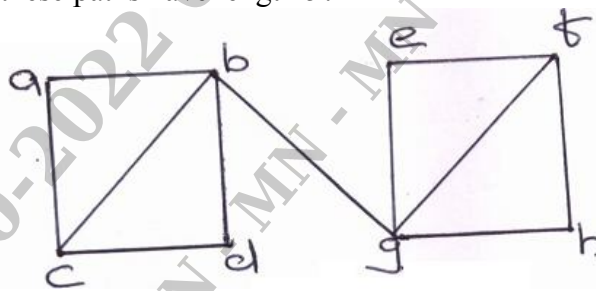


Fig. Q10 (a)

- b. Prove that in every tree $T = (V, E)$, $|V| = |E| + 1$ **(06 Marks)**
- c. Construct an optimal prefix code for the symbols a, o, q, u, y, z that occur with frequencies 20, 28, 4, 17, 12, 7 respectively. **(08 Marks)**

CBCS SCHEME

USN

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

18MAT41

Fourth Semester B.E. Degree Examination, July/August 2022 Complex Analysis, Probability and Statistical Methods

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Derive Cauchy-Riemann equation in Polar form. (06 Marks)
- b. Find the analytic function $f(z)$ whose real part is $x \sin x \cosh y - y \cos x \sinh y$ (07 Marks)
- c. If $f(z)$ is analytic show that
$$\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right] |f(z)|^2 = 4 |f'(z)|^2$$
 (07 Marks)

OR

- 2 a. Find the analytic function $f(z)$ given that the sum of its real and imaginary part is $x^3 - y^3 + 3xy(x - y)$ (06 Marks)
- b. Find the analytic function $f(z) = u + iv$ if $v = r^2 \cos 2\theta - r \cos \theta + 2$ (07 Marks)
- c. If $f(z)$ is analytic function then show that
$$\left\{ \frac{\partial}{\partial x} |f(z)| \right\}^2 + \left\{ \frac{\partial}{\partial y} |f(z)| \right\}^2 = |f'(z)|^2$$
 (07 Marks)

Module-2

- 3 a. State and prove Cauchy's Integral formula. (06 Marks)
- b. Evaluate $\int_0^{2+i} z^2 dz$ along (i) the line $y = \frac{x}{2}$ (ii) The real axis to 2 and then vertically to $2 + i$. (07 Marks)
- c. Find the bilinear transformation which maps the points 1, i , -1 onto the points i , 0 , $-i$ respectively. (07 Marks)

OR

- 4 a. Discuss the transformation $w = e^z$, with respect to straight lines parallel to x and y axis. (06 Marks)
- b. Using Cauchy's integral formula evaluate
$$\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$$
, where $c : |z| = 3$ (07 Marks)
- c. Find the bilinear transformation which maps the points $0, 1, \infty$ on to the points $-5, -1, 3$ respectively. (07 Marks)

Module-3

- 5 a. A random variable X has the following probability function for various values of X .

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k ²	2k ²	7k ² +k

Find i) k ii) $P(X < 6)$ iii) $P(3 < X \leq 6)$ (06 Marks)

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

- b. Out of 800 families with 5 children each, how many families would you expect to have
 (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atmost 2 girls, assuming equal probabilities for boys and girls. (07 Marks)
- c. The length in time (minutes) that a certain lady speaks on a telephone is a random variable with probability density function

$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find the value of the constant A. What is the probability that she will speak over the phone for (i) More than 10 minutes (ii) Less than 5 minutes (iii) Between 5 and 10 minutes.

(07 Marks)

OR

- 6 a. Find the constant C such that the function

$$f(x) = \begin{cases} Cx^2, & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases} \text{ is a probability density function. Also compute } P(1 < x < 2),$$

$$P(x \leq 1) \text{ and } P(x > 1)$$

(06 Marks)

- b. 2% fuses manufactured by a firm are found to be defective. Find the probability that the box containing 200 fuses contains

(i) No defective fuses (ii) 3 or more defective fuses (iii) At least one defective fuse.

(07 Marks)

- c. If x is a normal variate with mean 30 and standard deviation 5 find the probabilities that
 (i) $26 \leq x \leq 40$ (ii) $x \geq 45$ (iii) $|x - 30| > 5$

Given that $\phi(1) = 0.3413$, $\phi(0.8) = 0.2881$, $\phi(2) = 0.4772$, $\phi(3) = 0.4987$ (07 Marks)

Module-4

- 7 a. The following table gives the ages (in years) of 10 married couples. Calculate Karl Pearson's coefficient of correlation between their ages:

Age of husband (x)	23	27	28	29	30	31	33	35	36	39
Age of wife (y)	18	22	23	24	25	26	28	29	30	32

(06 Marks)

- b. In a partially destroyed laboratory record of correlation data only the following results are available:

Variance of x is 9 and regression lines are $8x - 10y + 66 = 0$, $40x - 18y = 214$. Find

- (i) Mean value of x and y
 (ii) Standard deviation of y
 (iii) Coefficient of correlation between x and y.

(07 Marks)

- c. Fit a parabola of the form $y = ax^2 + bx + c$ for the data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(07 Marks)

OR

- 8 a. Obtain the lines of regression and hence find the coefficient of correlation of the data:

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

(06 Marks)

- b. Show that if θ is the angle between the lines of regression

$$\tan \theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2} \left(\frac{1 - r^2}{r} \right)$$

(07 Marks)

- c. Fit a straight line $y = a + bx$ to the data

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

(07 Marks)

Module-5

- 9 a. The joint probability distribution of the random variables X and Y is given below.

X \ Y	-4	2	7
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Find (i) $E[X]$ and $E[Y]$ (ii) $E[XY]$ (iii) $\text{cov}(X, Y)$ (iv) $\rho(X, Y)$.

Also, show that X and Y are not independent.

(06 Marks)

- b. A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 of them were faulty. Test his claim at a significance level of 1% and 5% ($z_{0.05} = 1.96$, $z_{0.01} = 2.58$). (07 Marks)
- c. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure ($t_{0.05}$ for 11 d.f. is 2.201) (07 Marks)

OR

- 10 a. Define the terms :
 (i) Null hypothesis (ii) Type-I and Type - II errors (iii) Significance level (06 Marks)
- b. In an experiment of pea breeding the following frequencies of seeds were obtained:

Round Yellow	Wrinkled Yellow	Round Green	Wrinkled Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in proportions 9:3:3:1

Is the experiment in agreement with theory ($\chi_{0.5}^2$ for 3 d.f is 7.815)

(07 Marks)

- c. The joint probability distribution of two discrete random variable X and Y is given by $f(x, y) = k(2x + y)$ where x and y are integers such that $0 \leq x \leq 2$, $0 \leq y \leq 3$. Find k and the marginal probability distribution of X and Y. Show that the random variables X and Y are dependent. Also, find $P(X \geq 1, Y \leq 2)$. (07 Marks)

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

Fourth Semester B.E. Degree Examination, July/August 2022 Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Give the definition of an Algorithm and also discuss the characteristics of an Algorithm. (05 Marks)
- b. Define Space Complexity and Time Complexity of an algorithm and compute the time complexity of Fibonacci Numbers algorithm. (05 Marks)
- c. What are the various basic Asymptotic efficiency classes? Explain Big – O , Big - Ω , Big - θ notations with examples. (10 Marks)

OR

- 2 a. Give the Mathematical Analysis of Non recursive Matrix Multiplication Algorithm. (05 Marks)
- b. Give the general plan for analyzing Time efficiency of Recursive algorithms and also Analyze the Tower of Hanoi Recursive algorithm. (10 Marks)
- c. Mention the important problem types considered for design and analysis. Explain any two problem types. (05 Marks)

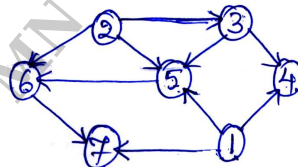
Module-2

- 3 a. Give the Recursive algorithm to find maximum and minimum element from the list and apply the algorithm to find maximum and minimum to the list
[31 , 22 , 12 , -7 , 75 , -6 , 17 , 47 , 60]. (10 Marks)
- b. Apply both mergesort and quicksort algorithm to sort the characters VTUBELAGAVI. (10 Marks)

OR

- 4 a. Apply Strassen's algorithm for matrix multiplication to multiply the following matrices and justify how the Strassen's algorithm is better. (10 Marks)
- $$\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 6 & 5 \end{bmatrix}$$
- b. Obtain the topological sort for the graph , Fig. Q4(b) using i) Source Removal method (10 Marks)
ii) DFS method.

Fig. Q4(b)



Module-3

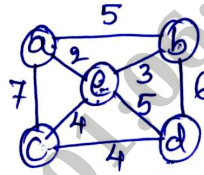
- 5 a. Solve the Greedy Knapsack problem, Fig, Q5(a) of capacity 5kgs. (05 Marks)

Fig. Q5(a)

Items	1	2	3	4
Profit	5	9	4	8
Weight	1	3	2	2

- b. Find the Optimal solution for the Greedy Job sequencing problem given $n = 4$, profits $[10, 30, 60, 40]$, deadlines $[2, 3, 1, 3]$. **(05 Marks)**
- c. Apply Prims and Kruskal's algorithm to find the minimal cost spanning tree for the graph given in Fig. Q5(c). **(10 Marks)**

Fig. Q5(c)

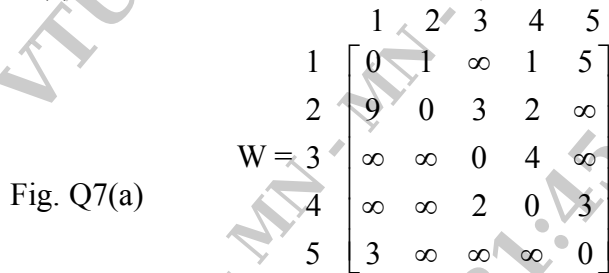


OR

- 6 a. A document contains the letters "A" through "E" with frequencies is follows :
 A : 22 , B : 13 , C : 18 , D : 16 , E : 31.
 Construct a Huffman Tree and codes and
 Encode : CAB , ADD , BAD , ACE
 Decode : 110011 and 1000110001. **(10 Marks)**
- b. Apply Heapsort for the list $[9, 7, 1, 8, 3, 6, 2, 4, 10, 5]$ using Bottom up approach. **(10 Marks)**

Module-4

- 7 a. Apply Floyd's algorithm to find the all pairs shortest path for the given adjacency matrix. Fig. Q7(a). **(10 Marks)**



- b. Solve the instance of 0/1 Knapsack problem Fig. Q7(b), using Dynamic Programming approach. **(10 Marks)**

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

Capacity $W = 5$

Fig. Q7(b)

OR

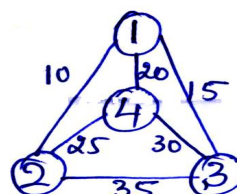
- 8 a. Construct an Optimal Binary search tree for the set of keys given in Fig. Q8(a). **(10 Marks)**

Keys	A	B	C	D
Probability	0.1	0.2	0.4	0.3

Fig. Q8(a)

- b. Apply Dynamic programming approach to solve the given Travelling Salesman problem. **(10 Marks)**

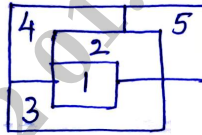
Fig. Q8(b)



Module-5

- 9 a. With the help of State Space tree, solve the 4 – queens problem by using Backtracking approach. **(10 Marks)**
 b. Color the regions in the Map given in Fig. Q9(b) , by applying backtracking graph color algorithm. Color = (R G B & Y). **(10 Marks)**

Fig. Q9(b)



OR

- 10 a. Apply LC – Branch and Bound approach to the assignment problem Fig. Q10(a). **(10 Marks)**

Fig. Q10(a)

$$C = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} \text{Person a} \\ \text{Person b} \\ \text{Person c} \\ \text{Person d} \end{matrix} & \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \end{matrix}$$

- b. Apply Branch and Bound approach to solve the instance of 0/1 Knapsack problem.

KnapSack Capacity $W = 10$

Items	1	2	3	4
Weight	4	7	5	3
Value	\$ 40	\$ 42	\$ 25	\$ 12

Fig. Q10(b)

(10 Marks)

CBCS SCHEME

USN

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

18CS43

Fourth Semester B.E. Degree Examination, July/August 2022 Operating Systems

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Distinguish between the following terms:
i) Multi programming and multitasking. (10 Marks)
ii) Multi processor systems and clustered systems. (05 Marks)
- b. Define Operating Systems. Explain dual mode of operating systems with a neat diagram. (05 Marks)
- c. Explain about system calls with an example of handling a user application invoking the open() system call. (05 Marks)

OR

- 2 a. What is a process? Illustrate with a neat diagram the different states of a process and control block. (05 Marks)
- b. Discuss the implementation of IPC using message passing systems in detail. (10 Marks)
- c. List and explain the services provided by OS for the user and efficient operation of system. (05 Marks)

Module-2

- 3 a. Give a brief description about multithreading and explain the different multi threading models. (05 Marks)
- b. Discuss the issues that come with multithreaded programming. (10 Marks)
- c. Explain CPU scheduling criteria. (05 Marks)

OR

- 4 a. Calculate the average waiting time and the average turnaround time by drawing the Gantt chart using FCFS, SRTF, RR (q = 2ms) and priority algorithms. Lower priority number represents higher priority.

Process	Arrival Time	Burst Time	Priority
P ₁	0	9	3
P ₂	1	4	2
P ₃	2	9	1
P ₄	3	5	4

(12 Marks)

- b. What is critical section problem? What are the requirements for the solution to critical section problem? Explain Peterson's solution. (08 Marks)

Module-3

- 5 a. What is a deadlock? What are the necessary conditions for the deadlock to occur? (05 Marks)
 b. How to prevent the occurrence of deadlock, explain in detail. (05 Marks)
 c. Consider the following snapshot of a system:

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P ₀	2	0	0	1	4	2	1	2	3	3	2	1
P ₁	3	1	2	1	5	2	5	2				
P ₂	2	1	0	3	2	3	1	6				
P ₃	1	3	1	2	1	4	2	4				
P ₄	1	4	3	2	3	6	6	5				

Answer the following using Banker's algorithm.

- i) Is the system in safe state? If so, give the safe sequence.
 ii) If process P₂ requests (0, 1, 1, 3) resources can it be granted immediately? (10 Marks)

OR

- 6 a. Explain paging hardware with TLB. (05 Marks)
 b. Explain segmentation in detail. (05 Marks)
 c. Discuss structure of page table with suitable diagrams. (10 Marks)

Module-4

- 7 a. Describe the steps in handling page faults. (06 Marks)
 b. Consider the page reference string: 1, 0, 7, 1, 0, 2, 1, 2, 3, 0, 3, 2, 4, 0, 3, 6, 2, 1 for a memory with 3 frames. Determine the number of page faults using FIFO, optimal and LRU replacement algorithms. Which algorithm is most efficient? (14 Marks)

OR

- 8 a. Explain the different allocation methods. (10 Marks)
 b. Discuss the various directory structures with required diagrams. (10 Marks)

Module-5

- 9 a. Explain access matrix method of system protection with domain as objects and its implementation. (10 Marks)
 b. A drive has 5000 cylinders numbered 0 to 4999. The drive is currently serving a request at 143 and previously serviced a request at 125. The queue of pending requests in FIFO order is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from current head position, what is the total distance travelled (in cylinders) by disk arm to satisfy the requests using FCFS, SSTF, SCAN, LOOK and C-LOOK algorithms. (10 Marks)

OR

- 10 a. With a neat diagram, explain the components of a Linux system. (08 Marks)
 b. Explain the different IPC mechanisms available in Linux. (06 Marks)
 c. Discuss about scheduling in Linux. (06 Marks)

* * * * *

USN

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

18CS44

Fourth Semester B.E. Degree Examination, July/August 2022 Microcontroller and Embedded Systems

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Compare Microprocessors and Microcontrollers. (06 Marks)
b. Discuss the ARM design Philosophy. (06 Marks)
c. With a neat diagram, explain the four main hardware components of an ARM based embedded device. (08 Marks)

OR

- 2 a. Explain the ARM Core data flow model with a neat diagram. (08 Marks)
b. Draw the basic layout of a generic program status register and briefly explain the various fields. (06 Marks)
c. What is Pipelining? Illustrate it with a simple example. (06 Marks)

Module-2

- 3 a. Explain the different Data Processing Instructions in ARM. (10 Marks)
b. Briefly explain the different Load – Store Instruction categories used with ARM. (10 Marks)

OR

- 4 a. Write a program for forward and backward branch by considering an example. (06 Marks)
b. Explain Co – Processor Instructions of ARM processor. (06 Marks)
c. Write a note on Profiling and Cycle Counting. (08 Marks)

Module-3

- 5 a. What is an Embedded System? Differentiate between general purpose computing system and embedded system. (06 Marks)
b. List any four purposes of Embedded system with examples. (08 Marks)
c. Write short notes on : i) Real Time Clock ii) Watch Dog Timer. (06 Marks)

OR

- 6 a. Briefly describe the classification of Embedded system. (08 Marks)
b. Explain the following :
i) I²C Bus ii) S P I Bus iii) Reset Circuit iv) 1 – Wire Interface. (12 Marks)

Module-4

- 7 a. What are the Operational and Non – Operational Quality Attributes of an Embedded system? (10 Marks)
b. Explain the different communication buses used in Automotive applications. (06 Marks)
c. Design an FSM model for Tea / Coffee vending machine. (04 Marks)

OR

- 8 a. Explain the Fundamental issues in Hardware Software Co - design. (06 Marks)
b. Explain the Assembly language based Embedded firmware development with a diagram. (06 Marks)
c. With a neat block diagram, how source file to object file translation takes place in High level language based firmware development. (08 Marks)

Module-5

- 9 a. With a neat diagram, explain Operating System Architecture. (08 Marks)
b. Explain Multithreading. (06 Marks)
c. Explain the concept of Binary Semaphore. (06 Marks)

OR

- 10 a. Explain the role of Integrated Development Environment (IDE) for Embedded Software development. (08 Marks)
b. Write a note on Message passing. (08 Marks)
c. Explain the concept of deadlock with a neat diagram. (04 Marks)

* * * * *

CBCS SCHEME

USN

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

18CS45

Fourth Semester B.E. Degree Examination, July/August 2022 Object Oriented Concepts

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 concept of object oriented programming language :
 - (i) Encapsulation
 - (ii) Polymorphism
 - (iii) Inheritance

(06 Marks)
- b. What is an inline function? What are the advantages of inline functions? Write a C++ program to find minimum of two numbers using inline function.

(08 Marks)
- c. Define a friend function. Illustrate with an example.

(06 Marks)

OR

- 2 a. Why friend functions are required? Write a C++ program to illustrate the use of friend function.

(06 Marks)
- b. What is function overloading? Write a C++ program to swap two integers by function overloading.

(08 Marks)
- c. Explain instance variable hiding. Explain with example how to overcome instance variable hiding.

(06 Marks)

Module-2

- 3 a. What are constructors and destructors? Explain default constructors with example.

(08 Marks)
- b. Illustrate with an example the order of calling constructor and destructor.

(08 Marks)
- c. Explain namespaces with example.

(04 Marks)

OR

- 4 a. Explain the following : Java buzzwords, Object oriented, Robust, Multi-threaded, Architecture neutral.

(08 Marks)
- b. Write a Java program to find the sum of even numbers using for each version of for loop and print the result.

(06 Marks)
- c. Explain labelled break and labelled continue with examples.

(06 Marks)

Module-3

- 5 a. Explain general form of a class with example.

(06 Marks)
- b. Write a Java program to implement stack of integers. Provide constructors and methods to push an element, POP an element and display the contents of the stack.

(14 Marks)

OR

- 6 a. Explain multilevel inheritance with an example.

(06 Marks)
- b. Explain exception handling mechanism provided in Java. Give syntax. Write a Java program to demonstrate exception handling construct.

(08 Marks)
- c. Write a Java program to create user defined exception and demonstrate its use.

(06 Marks)

Module-4

- 7 a. Explain the steps to create a package in Java with an example. (08 Marks)
b. Explain interfaces in Java with example. (06 Marks)
c. Can interfaces be inherited? Justify with an example. (06 Marks)

OR

- 8 a. Explain the following methods of Thread class, getName (), getPriority (), isAlive (), join (). (08 Marks)
b. Write a Java program to illustrate thread creation using Runnable interface. (06 Marks)
c. Write a Java program to illustrate synchronization using synchronized methods. (06 Marks)

Module-5

- 9 a. What are events, event listener and event source. Explain delegation event model used to handle events in Java. (07 Marks)
b. Write a Java program to handle mouse dragged and mouse moved events. (07 Marks)
c. Explain Adapter class with example. (06 Marks)

OR

- 10 a. Explain the following with examples : (04 Marks)
(i) JLabel (ii) JTextField
b. Write a Java program to create a button, on clicking which displays "Welcome to VTU". (06 Marks)
c. Write a Java program to create a table with column heading as FirstName, LastName, Age. Insert at least 3 records in the table and display. (10 Marks)

* * * * *

CBCS SCHEME

USN

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

18CS46

Fourth Semester B.E. Degree Examination, July/August 2022 Data Communication

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. What is Data Communication? With neat diagram, explain the components of data communication. (08 Marks)
- b. With neat diagram, explain four basic topologies. Assume that 10 devices are connected in mesh topology. How many duplex links are needed? How many ports are needed for each device? (08 Marks)
- c. Explain Half Duplex and Full Duplex with respect to data communication. (04 Marks)

OR

- 2 a. With neat diagram, explain TCP/IP protocol suite of computer networks. (08 Marks)
- b. Define transmission impairments. Explain different, causes of transmission impairment during signal transmission. (08 Marks)
- c. Explain briefly about Shannon capacity and Nyquist bit rate for communication channel. (04 Marks)

Module-2

- 3 a. With neat diagram, explain the most common technique to change analog signal to digital signal. (12 Marks)
- b. With a neat diagram, explain ASK, FSK and PSK. (06 Marks)
- c. In a digital transmission the receiver clock is 0.3 percent faster than the sender clock. How many extra bits per second does the receiver receive if the data rate is 1 Mbps? (02 Marks)

OR

- 4 a. Define line coding. List out its characteristics. Represent the sequence "01001110" using NRZ-L, NRZ-I and Manchester scheme. (10 Marks)
- b. Explain parallel and serial transmission modes. (06 Marks)
- c. An analog signal has a bit rate of 8000 bps and baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? (04 Marks)

Module-3

- 5 a. What is circuit switching? Enumerate the characteristics of circuit switching. Analyze the three stages of circuit switching. (10 Marks)
- b. What is multiplexing? Explain wavelength division multiplexing. (05 Marks)
- c. Given data word 101001111 and divisor 10111. Show the generation of CRC codeword at the sender site. (05 Marks)

OR

- 6 a. What is spread spectrum? Explain FHSS and DHSS. (10 Marks)
- b. Analyze how message can be transferred from one system to another using datagram network and calculate the delay in the network. (05 Marks)

- c. Assume a packet is made any of four 16 bits words $(466F)_{16}$, $(726F)_{16}$, $(757A)_{16}$ and $(616E)_{16}$. Find the sender site checksum using traditional checksum algorithm. (05 Marks)

Module-4

- 7 a. With neat diagram, explain point-to-point protocol frame format. (06 Marks)
b. Explain pure ALOHA and slotted ALOHA protocols. (08 Marks)
c. Explain the working of stop-and-wait protocol for Noiseless channels. (06 Marks)

OR

- 8 a. Analyze channelization. Explain Code Division Multiple Access (CDMA). (08 Marks)
b. Mention different controlled access methods. Explain token passing method. (06 Marks)
c. Explain class full addressing of IPV4. (06 Marks)

Module-5

- 9 a. Explain the operation of Cellular Telephony. (08 Marks)
b. Explain Bluetooth Architecture. (05 Marks)
c. Explain the different types of addressing mechanisms in IEEE-802.11. (07 Marks)

OR

- 10 a. With neat diagram, explain Ethernet frame format. (10 Marks)
b. Explain access control of wireless LAN. (05 Marks)
c. Explain Fourth Generation (4G) of Cellular Telephone. (05 Marks)

* * * * *

CBCS SCHEME

USN

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

18CS51

Fifth Semester B.E. Degree Examination, July/August 2022 Management and Entrepreneurship for IT Industry

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define Management. Explain different functions of management. (10 Marks)
b. Explain the general principles of administrative management theory as laid down by Henry Fayol. (10 Marks)

OR

- 2 a. Explain the steps involved in planning. Mention the importance and purpose of planning process. (10 Marks)
b. Define Organization. Explain line and staff organization with its advantages and disadvantages. (05 Marks)
c. Define Selection. Explain the sources of Recruitment. (05 Marks)

Module-2

- 3 a. Define Motivation. Explain Herzberg's two factor theory to help a manager to motivate his subordinates. (10 Marks)
b. Define Leadership. Explain various leadership styles. (10 Marks)

OR

- 4 a. Define Control. Explain the different methods of establishing control. (10 Marks)
b. Define co-ordination, what is the need for co-ordination? (05 Marks)
c. Explain the requirements of effective direction. (05 Marks)

Module-3

- 5 a. What are the different classifications of Entrepreneur? (10 Marks)
b. Explain Technical and market feasibility study. (10 Marks)

OR

- 6 a. Explain the role of entrepreneurs in economic development of India. (10 Marks)
b. Discuss the barriers of entrepreneurs. (05 Marks)
c. Discuss the differences between Entrepreneur, Intrapreneur and Manager. (05 Marks)

Module-4

- 7 a. Explain project Identification and project selection. (10 Marks)
b. Explain the following functional areas of management with respect to ERP.
i) Supply Chain Management (05 Marks)
ii) Human Resources. (05 Marks)

OR

- 8 a. Define ERP. Explain importance and characteristics of ERP. (10 Marks)
b. Explain the steps involved in formulation of project report. (10 Marks)

Module-5

- 9 a. Discuss the case study of NR Narayan Murthy (Infosys) and Captain G.R. Gopinath. (10 Marks)
b. Explain the steps in establishing micro and small enterprises. (10 Marks)

OR

- 10 a. Explain the following: i) NSIC ii) DIC iii) KSFC iv) KIADB v) TECSOK. (10 Marks)
b. Explain trademark, copyright and patents. (10 Marks)

* * * * *

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

CBCS SCHEME

USN

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

18CS53

Fifth Semester B.E. Degree Examination, July/August 2022 Database Management System

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Discuss the advantages of using the DBMS approach. (06 Marks)
- b. Explain three-schema architecture with a neat diagram. Why do we need mapping between schema levels? (06 Marks)
- c. Explain the component modules of DBMS and their interaction with the help of a diagram. (08 Marks)

OR

- 2 a. Define the following terms:
(i) Weak entity (ii) DBMS catalog (iii) Snapshot
(iv) Value sets (v) Cardinality ratio (vi) Degree of a relationship (06 Marks)
- b. Explain the different categories of data models. (06 Marks)
- c. Write the ER diagram for an employee database. The constraints are as follows:
(i) An employee works for a department
(ii) Every department is headed by a manager
(iii) An employee works on one or more projects
(iv) An employee has dependents
(v) A department controls the projects (08 Marks)

Module-2

- 3 a. What is meant by Integrity Constraint? Explain the importance of referential integrity constraint. How referential integrity constraint is implemented in SQL. (08 Marks)
- b. Write the relational algebra operations to perform the following queries:
(i) Retrieve the name and address of all employees who work for the "Accounts" department.
(ii) Retrieve the names of employers who have no dependents.
(iii) Find the names of employees who work on all the projects controlled by department number 2. (06 Marks)
- c. Explain the relational algebra operations from Set theory, with examples. (06 Marks)

OR

- 4 a. Explain the ER to relational mapping algorithm with suitable example for each step. (10 Marks)
- b. Write the SQL queries for the following database schema:
Student (USN, NAME, BRANCH, PERCENTAGE)
Faculty (FID, FNAME, DEPARTMENT, DESIGNATION, SALARY)
Course (CID, CNAME, FID)
Enroll (CID, USN, GRADE)
(i) Retrieve the names of all students enrolled for the course 'CS_54'
(ii) List all the departments having an average salary of the faculties above Rs.10,000.
(iii) List the names of the students enrolled for the course 'CS_51' and having 'B' grade. (06 Marks)
- c. Explain with examples in SQL: (i) INSERT command (ii) UPDATE command (04 Marks)

Module-3

- 5 a. How are assertions and triggers defined in SQL? Explain with examples. (08 Marks)
 b. Explain stored procedures in SQL with an example. (06 Marks)
 c. List out and explain the different types of JDBC drivers. (06 Marks)

OR

- 6 a. What is a three-tier architecture? What advantages it offer over single tier and two tier architectures? Give a short overview of the functionality at each of the three-tier. (10 Marks)
 b. How to create views in SQL? Explain with an example. (06 Marks)
 c. What is SQLJ? How it is different from JDBC? (04 Marks)

Module-4

- 7 a. Explain an informal design guidelines for relational schema design. (08 Marks)
 b. What is the need for normalization? Explain 1NF, 2NF and 3NF with examples. (08 Marks)
 c. What do you understand by attribute closure? Give an example. (04 Marks)

OR

- 8 a. What is functional dependency? Explain the inference rules for functional dependency with proof. (08 Marks)
 b. Define 4NF. When it is violated? Why is it useful? (06 Marks)
 c. Consider two sets of functional dependency $F = \{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$ and $G = \{A \rightarrow CD, E \rightarrow AH\}$. Are they equivalent? (06 Marks)

Module-5

- 9 a. Why concurrency control is needed? Demonstrate with an example. (10 Marks)
 b. Discuss the UNDO and REDO operations and the recovery techniques that use each. (06 Marks)
 c. Explain the ACID properties of a database transaction. (04 Marks)

OR

- 10 a. Discuss Two-Phase Locking Technique for concurrency control. (10 Marks)
 b. When deadlock and starvation problem occur? Explain how these problems can be resolved. (10 Marks)

* * * * *

CBCS SCHEME

USN

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

18CS54

Fifth Semester B.E. Degree Examination, July/August 2022 Automata theory and Computability

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Define the following terms with an example
i) Alphabet ii) Power of an alphabet
iii) String iv) String concatenation v) language. (05 Marks)
 - Explain the hierarchy of language classes in automata theory with diagram. (05 Marks)
 - Design DFMSM for each of the following language.
i) $L = \{\omega \in \{0,1\}^* : \omega \text{ does not end in } 01\}$
ii) $L = \{\omega \in \{a,b\}^* : \text{every } a \text{ in } \omega \text{ is immediately preceded and followed by } b\}$. (10 Marks)

OR

- Use MiNDFSM algorithm to minimize M given in Fig Q2(a).

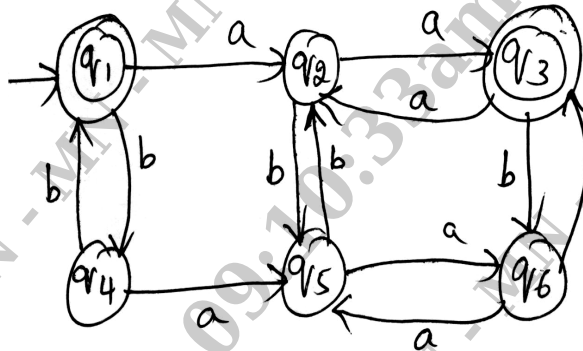


Fig Q2(a)

(08 Marks)

- Convert the following NDFSM given in Fig Q2(b) to its equivalent DFSM.

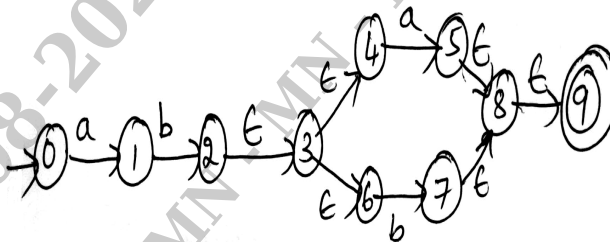


Fig Q2(b)

(08 Marks)

- Design a mealy machine that takes binary number as input and produces 2's complement of the number as output. (04 Marks)

Module-2

- Define Regular expression. Write regular expression for the following language.
i) $L = \{0^n 1^m \mid m \geq 1, n \geq 1, mn \geq 3\}$
ii) $L = \{\omega \in \{a,b\}^* : \text{string with atmost one pair of consecutive } a\}$ (08 Marks)
 - Obtain NDFSM for the regular expression $(a^* \cup ab)(a \cup b)^*$. (05 Marks)

- c. Build a regular expression for the given FSM in Fig Q3(c).

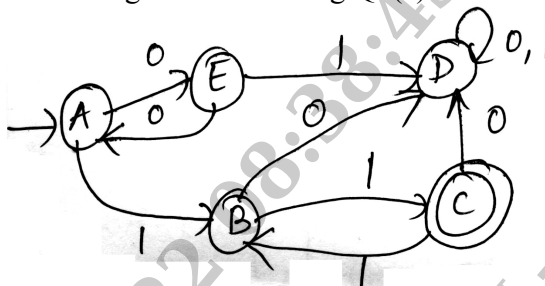


Fig Q3(c)

(07 Marks)

OR

- 4 a. State and prove pumping Lemma theorem for regular language. (08 Marks)
 b. Prove that regular languages are closed under complement. (05 Marks)
 c. Write regular expression, regular grammar and FSM for the languages
 $L = \{ \omega \in \{a, b\}^* : \omega \text{ ends with pattern } aaaa \}$. (07 Marks)

Module-3

- 5 a. Define Context Free Grammar (CFG). Write CFG for the following languages
 $L = \{ 0^m 1^m 2^n : m \geq 1, n \geq 0 \}$. (05 Marks)
 b. What is ambiguity in a grammar? Eliminate ambiguity from balanced parenthesis grammar? (08 Marks)
 c. Simplify the grammar by removing productive and unreachable symbols
 $S \rightarrow AB|AC$
 $A \rightarrow aA|b| \epsilon$
 $B \rightarrow bA$
 $C \rightarrow bCa$
 $D \rightarrow AB$ (07 Marks)

OR

- 6 a. Define PDA and design PDA to accept the language by final state method. (07 Marks)
 $L(M) = \{ \omega C \omega^R \mid \omega \in (a \cup b)^* \text{ and } \omega^R \text{ is reverse of } \omega \}$
 b. Convert the following grammar to CNF
 $S \rightarrow ASB| \epsilon$
 $A \rightarrow aAS|a$
 $B \rightarrow SbS|A|bb$ (08 Marks)
 c. Consider the grammar
 $E \rightarrow E + E | E * E | (E) | id$
 Construct LMD, RMD and parse tree for the string $(id + id * id)$. (05 Marks)

Module-4

- 7 a. Define Turing Machine (TM). Design a TM for language
 $L = \{ 0^n 1^n \mid n \geq 1 \}$. Show that the string 0011 is accepted by ID. (10 Marks)
 b. Explain multiple TM with a neat diagram. (05 Marks)
 c. Explain any two techniques for TM construction. (05 Marks)

OR

- 8 a. Design a TM for the language $L = \{1^n 2^n 3^n \mid n \geq 1\}$ show that the string 11 2233 is accepted by ID. (12 Marks)
- b. Demonstrate the model of Linear Bounded Automata (LBA) with a neat diagram. (08 Marks)

Module-5

- 9 a. Show that A_{DFA} is decidable. (05 Marks)
- b. Define Post Correspondence Problem (PCP). Does the PCP with two list $x = (b, bab^3, ba)$ $y = (b^3, ba, b)$ have a solution. (08 Marks)
- c. Explain quantum computation. (07 Marks)

OR

- 10 a. Prove the A_{TM} is undecidable. (05 Marks)
- b. Does the PCP with two list $x = (0, 01000, 01)$ $y = (000, 01, 1)$ have a solution. (05 Marks)
- c. State and explain Church Turning Thesis in detail. (10 Marks)

USN

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

18CS55

Fifth Semester B.E. Degree Examination, July/August 2022 Application Development using Python

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. List the salient features of Python Programming Language. (06 Marks)
- b. List and explain the Syntax of all Flow control statements with example. (08 Marks)
- c. Write a Python program to calculate the area of circle, rectangular and triangle. Print the results. (06 Marks)

OR

- 2 a. What is a Function? How to define a function in Python? Explain with suitable example. (06 Marks)
- b. Explain Local and Global scope of variable in Python with example. (08 Marks)
- c. What is Exception Handling? How Exceptions are handled in Python? Write a Python program with exception handling code to solve divide – by – zero error situation. (06 Marks)

Module-2

- 3 a. What is Lists? Explain the concept of list slicing with example. (06 Marks)
- b. What is Dictionary? How it is different from List? Write a program to count the number of occurrences of character in a string. (07 Marks)
- c. Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lower case letters. (07 Marks)

OR

- 4 a. List out all the useful string methods which supports in Python. Explain with an example for each method. (10 Marks)
- b. What is the difference between copy.copy () and copy.deepcopy () Function applicable to a list or Dictionary in Python? Give suitable examples for each. (06 Marks)
- c. Write a Python to Swap cases of a given string
Input : Java
Output : jAVA. (04 Marks)

Module-3

- 5 a. What are Regular Expressions? What are the different steps to be follow to use a Regular Expression in Python. (06 Marks)
- b. Describe the following with suitable Python code Snippet :
 - i) Greedy and Non Greedy Pattern Matching.
 - ii) findall () method of Regex object. (07 Marks)
- c. Write a Python program to extract Phone numbers and Email addresses using Regular Expressions. (07 Marks)

OR

- 6 a. How do we specify and handle Absolute Relative Path? (08 Marks)
 b. Explain the File Reading / Writing process with suitable Python program. (06 Marks)
 c. Write a Python program to create a folder PYTHON and under the hierarchy 3 files file1 , file2 and file3. Write the content in file1 as “VTU” and in file2 as “UNIVERSITY” and file3 content should be opening and merge of file1 and file2. Check out the necessary condition before write file3. (06 Marks)

Module-4

- 7 a. What is Class? How do we define a class in Python? How to instantiate the class and how class members are accessed? (08 Marks)
 b. Write a Python program that uses datetime module within a class, takes a birthday as input and print users age and the Number of days , hours , minutes and seconds until their next birthday. (07 Marks)
 c. Illustrate the concept of modifier with Python code. (05 Marks)

OR

- 8 a. Explain init and str method with an example Python program. (08 Marks)
 b. What are Polymorphic functions? Explain with code Snippet. (06 Marks)
 c. Illustrate the concept of Inheritance with example. (06 Marks)

Module-5

- 9 a. How do we download a file and save it to hard drive using request module? (06 Marks)
 b. Write short notes on :
 Creating , Copying and Rotating pages with respect to pdf. (06 Marks)
 c. Explain Selenium’s Web Drive method for Finding elements. (08 Marks)

OR

- 10 a. Write a program that takes a Number N from command line and creates an N × N Multiplication table in Excel Spread Sheet. (10 Marks)
 b. What is CSV and JSON Files? Explain with an example, Program the usage of Json Module in Python. (10 Marks)

* * * * *

GBCS SCHEME

USN

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

18CS56

Fifth Semester B.E. Degree Examination, July/August 2022

Unix 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 Unix architecture with neat diagram. (09 Marks)
b. Explain the salient features of Unix operating system. (07 Marks)
c. Explain the following commands : (i) date (ii) echo (04 Marks)

OR

- 2 a. Explain three categories of files in unix. (06 Marks)
b. What are internal and external commands in unix? Explain them with example. (06 Marks)
c. Explain the following commands with syntax and example,
(i) cat (ii) mv (iii) wc (iv) mkdir (08 Marks)

Module-2

- 3 a. Discuss the significance of the seven fields of `ls - l` command. (09 Marks)
b. Explain three standard file and redirection in unix. (06 Marks)
c. Explain grep command with example. (05 Marks)

OR

- 4 a. What are file permission? Illustrate the different ways of setting the file permission. (10 Marks)
b. Explain shell interpreter cycle with flowchart. (05 Marks)
c. Explain for and while control statements in shell script with example. (05 Marks)

Module-3

- 5 a. Explain the following API's with prototype (i) open (ii) fcntl (10 Marks)
b. Explain the fork and v-fork system call. How fork system call differs from v-fork? (10 Marks)

OR

- 6 a. With neat sketch, explain memory layout of C program. (10 Marks)
b. Explain the `setjmp()` and `longjmp()` functions with an example C/C++ program. (10 Marks)

Module-4

- 7 a. What are pipes? Explain different ways to view a half-duplex pipe. Write a C/C++ program to send data from parent process to child process using pipes. (10 Marks)
b. What is FIFO? With a neat diagram, explain the client-server communication using FIFO. (10 Marks)

OR

- 8 a. Write a note on: (i) Process Accounting (ii) Process Time (10 Marks)
b. Explain briefly with example : (i) Message Queue (ii) Semaphore (10 Marks)

Module-5

- 9 a. What are daemon process? Mention and explain coding rules of daemon process. (10 Marks)
b. Explain `kill()` API and `alarm()` API. (10 Marks)

OR

- 10 a. Define signal. Explain Sigaction API with demonstrating program. (10 Marks)
b. What is error logging? With a neat block diagram, discuss the error login facility in BSD. (10 Marks)

* * * * *

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

CBCS SCHEME

USN

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

18CS61

Sixth Semester B.E. Degree Examination, July/August 2022 System Software and Compilers

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Explain in detail SIC/XE Machine Architecture. (10 Marks)
b. List the various machine independent assembler features. Explain the control sections how the assembler convert them into object code. (10 Marks)

OR

- 2 a. Write an algorithm for One Pass Assembler and give sample object program from One Pass Assembler. (10 Marks)
b. What are the basic functions of loader? Explain two ways of program relocation in loaders. (10 Marks)

Module-2

- 3 a. Explain various phases of Compiler. Show the translations for an Assignment statement.
Position = Initial + rate * 60.
Clearly indicate the output of each phase. (12 Marks)
b. What are the applications of Compiler? Explain. (08 Marks)

OR

- 4 a. Write a brief note on Language Processing System. (06 Marks)
b. Explain the concept of input buffering in the Lexical analysis with its implementation. (10 Marks)
c. Define Token, Lexeme and Pattern with example. (04 Marks)

Module-3

- 5 a. Define Context Free Grammar. Obtain CFG to generate strings of a's and b's having substring "ab". (10 Marks)
b. Consider grammar given below from which any arithmetic expressions can be obtained.
 $E \rightarrow E + E$ $E \rightarrow E - E$ $E \rightarrow E * E$ $E \rightarrow E | E$ $E \rightarrow id$
Show that the grammar is ambiguous for the sentence $id + id * id$. (10 Marks)

OR

- 6 a. Write an algorithm to eliminate left recursion from a grammar. Eliminate left recursion from the given grammar. $S \rightarrow Aa | b$ $A \rightarrow Ac | Sd | \epsilon$. (10 Marks)
b. Define Shift – Reduce Parser and Handle. What are conflicts in shift – reduce parse, explain with example. (06 Marks)
c. List and explain different actions of shift – reducer parser (04 Marks)

Module-4

- 7 a. Explain the three basic section of LEX program with example. (10 Marks)
b. Write LEX program to count word, character and line count in a given file. (10 Marks)

CBCS SCHEME

USN

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

18CS62

Sixth Semester B.E. Degree Examination, July/August 2022 Computer Graphics and Visualization

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Explain Refresh Cathode ray tube with neat diagram. (10 Marks)
- b. What is Computer Graphics? Explain the application of Computer Graphics. (10 Marks)

OR

- 2 a. With a neat diagram, explain the architecture of a raster display system with integrated display processor. (10 Marks)
- b. Explain Bresenham's Line drawing algorithm, with an example. (10 Marks)

Module-2

- 3 a. What is the need of Homogeneous Coordinate System? Explain Translation, Rotation and Scaling in 2D Homogeneous Coordinate System, with matrix representation. (10 Marks)
- b. Explain with example any two algorithms used to identify interior and exterior area of a polygon. (05 Marks)
- c. Explain two dimensional viewing transformation pipe line. (05 Marks)

OR

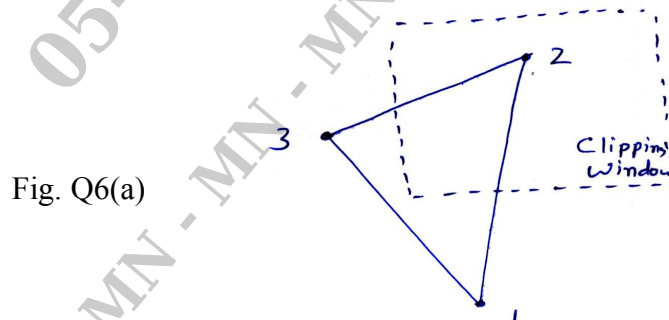
- 4 a. Explain Scan Line polygon fill algorithm. (10 Marks)
- b. Explain different OpenGL routines used for manipulating display window. (05 Marks)
- c. Explain OpenGL 2D – viewing function. (05 Marks)

Module-3

- 5 a. What is Clipping? Explain Cohen – Sutherland Line Clipping algorithm, with suitable example. (10 Marks)
- b. Explain Basic Illumination Model and explain Phong's Lighting model. (10 Marks)

OR

- 6 a. Explain Sutherland – Hodgman Polygon Clipping algorithm. Find the final clipping polygon for the following Fig. Q6(a). (10 Marks)



- b. Write an OpenGL program to rotate a cube in all directions. (10 Marks)

Module-4

- 7 a. Explain with example, Depth buffer algorithm used for visible surface detection. Discuss the advantages and disadvantages. (10 Marks)
- b. Explain 3D viewing pipeline with neat diagram and transformation from World to viewing coordinates. (10 Marks)

OR

- 8 a. Explain Orthogonal Projection in details. (10 Marks)
- b. Explain Perspective Projection with reference point and vanishing point with neat diagram. (05 Marks)
- c. Explain Symmetric Perspective – Projection Frustum. (05 Marks)

Module-5

- 9 a. What are the different Logical input devices and explain with an example. (10 Marks)
- b. Discuss the various input modes with diagram. (05 Marks)
- c. Explain the creation of display list with an example. (05 Marks)

OR

- 10 a. List the properties of Bezier curve and also explain Beizer techniques of generating curves. (10 Marks)
- b. Describe the various features that a good interactive program should incorporate. (05 Marks)
- c. Explain how menus in OpenGL are created. (05 Marks)

* * * * *

CBCS SCHEME

USN

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

18CS63

Sixth Semester B.E. Degree Examination, July/August 2022 Web Technology and its Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. What is HTML? Explain the structure of HTML document with an example. (08 Marks)
- b. What are contextual selectors? Identify and explain 4 different contextual selectors. (08 Marks)
- c. Write the syntax of below mentioned HTML elements and briefly explain with examples.: (04 Marks)
(i) `<a>` (ii) ``

OR

- 2 a. Illustrate the CSS box model. Be sure to label and briefly explain each component of the box. (08 Marks)
- b. List the HTML5 semantic elements and explain any three with suitable examples. (08 Marks)
- c. Describe the embedded style sheet with example. (04 Marks)

Module-2

- 3 a. Write HTML code for the following table with appropriate styling:

Year : 2021							
Month	Days		Dates				
	Name	Id					
March	Mon	1	1	8	15	22	29
	Tue	2	2	9	16	23	30
	Wed	3	3	10	17	24	31
	Thu	4	4	11	18	25	
	Fri	5	5	12	19	26	
	Sat	6	6	13	20	27	
	Sun	7	7	14	21	28	

- b. What is responsive design? Explain in brief the four key components that make a responsive design work. (08 Marks)
- c. Illustrate and briefly explain the use of number and range HTML5 controls. (04 Marks)

OR

- 4 a. Illustrate the construction of multi column layouts with example. (08 Marks)
- b. Explain the different types of buttons defined in HTML. (08 Marks)
- c. How the block level and inline elements are displayed in the normal flow? (04 Marks)

Module-3

- 5 a. Write Javascript code that uses function for the following problems:
(i) For the string input the output should be to display the position of left most vowel.
(ii) For the numeric input output should be to display the reverse of a number. (08 Marks)
- b. Explain the two approaches to embed PHP script in HTML with suitable and compare the two approaches. (08 Marks)
- c. What is DOM? Briefly explain the different types of nodes. (04 Marks)

OR

- 6 a. Explain the PHP module in Apache and describe the difference between multi-threaded and multi-process setup. (08 Marks)
- b. Discuss the different ways the javascript can be included in HTML page and which is the most preferred way and why? (08 Marks)
- c. List the Web Server's responsibilities. (04 Marks)

Module-4

- 7 a. What are super globals? List the different super globals and briefly explain any two. (08 Marks)
- b. Explain the support of object oriented design in PHP. (08 Marks)
- c. Write a PHP code that checks for valid MIME types and file extensions. (04 Marks)

OR

- 8 a. Write a PHP program to create a class called "Artist" with suitable constructor. All it's data members are accessible only inside the class.
Data members : first name, last name, birth city, birth date
Data functions : getters and setters
Using above class instantiate two objects and displays the artist details. (08 Marks)
- b. Explain the two techniques provided in PHP for reading/writing files and also list comparative advantages and disadvantages. (08 Marks)
- c. What is a visibility of a class member? Briefly explain the different levels of visibility. (04 Marks)

Module-5

- 9 a. What is session state? How does session state works with suitable example. (08 Marks)
- b. Demonstrate the manipulation of attributes, properties and styles of the element using jQuery with suitable examples. (08 Marks)
- c. What is JASON? Explain with the code example, how to convert string to JASON and vice versa. (04 Marks)

OR

- 10 a. What is AJAX? Using an UML diagram, explain how the asynchronous request is handled. (08 Marks)
- b. Explain the loading and processing of an XML document in javascript with suitable example. (08 Marks)
- c. Using functions, emulate a class with data members and member functions in javascript. (04 Marks)

* * * * *

CBCS SCHEME

USN

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

18CS641

Sixth Semester B.E. Degree Examination, July/August 2022 Data Mining and Data Warehousing

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With a neat diagram, explain a Three – Tier Data Warehouse. (10 Marks)
b. List and explain Data Warehouse Models. (10 Marks)

OR

- 2 a. With suitable example, explain Star schema , Snow Flake schema , Fact Constellation schema for Multidimensional database. (10 Marks)
b. Explain OLAP Operations with example. (10 Marks)

Module-2

- 3 a. Explain OLAP Data indexing for Bitmap Index and Join index. (10 Marks)
b. Differentiate ROLAP , MOLAP and HOLAP Servers. (10 Marks)

OR

- 4 a. Explain Data – preprocessing steps and the challenges faced in Data Mining. (10 Marks)
b. Briefly explain Similarity and Dissimilarity between the objects. Find the SMC and Jacquard coefficient of Two binary vectors.
 $X = (1, 0, 0, 0, 0, 0, 0, 0, 0, 0)$ $Y = (0, 0, 0, 0, 0, 0, 0, 0, 0, 1)$. (10 Marks)

Module-3

- 5 a. Explain the rule generation in Apriori Algorithm with example. (10 Marks)
b. Explain the Alternative method for generating frequent itemset. (10 Marks)

OR

- 6 a. Briefly explain FP growth algorithm. (10 Marks)
b. Explain the objective measure of Interestingness for evaluating association patterns. (10 Marks)

Module-4

- 7 a. With a neat block diagram, explain general approach to solve classification problems with application. (10 Marks)
b. Explain with example, how to build decision tree using Hunt's algorithm. (10 Marks)

OR

- 8 a. Explain different method for comparing classifier. (10 Marks)
b. Explain the rule based classifier with example. (10 Marks)

Module-5

- 9 a. Describe K – means clustering algorithm. What are its limitations? (10 Marks)
b. With example, explain Agglomerative Hierarchical clustering with example. (10 Marks)

OR

- 10 a. With Time and Space complexity, explain DBSCAN Clustering Algorithm. (10 Marks)
b. Explain the BRICH Scalable Algorithm. (10 Marks)

* * * * *

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

CBCS SCHEME

USN

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

18CS643

Sixth Semester B.E. Degree Examination, July/August 2022 Cloud Computing and Its Applications

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 cloud computing reference model. (08 Marks)
b. List the characteristics and benefits of cloud computing. (06 Marks)
c. Write a note on challenges in cloud computing. (06 Marks)

OR

- 2 a. Explain in brief the services provided by following cloud service provider
i) Amazon Web Service ii) Microsoft Azure iii) Hadoop. (10 Marks)
b. Define virtualization and explain hardware level virtualization with its pro's and con's of virtualization. (10 Marks)

Module-2

- 3 a. Explain the following in detail
i) Hardware as service ii) Platform as service iii) Software as service. (10 Marks)
b. Explain the open challenges faced in cloud computing in detail. (10 Marks)

OR

- 4 a. Explain the following deployment mode platform for building Aneka cloud
i) Private cloud ii) Public cloud iii) Hybrid cloud. (10 Marks)
b. Explain Aneka SDK in detail. (10 Marks)

Module-3

- 5 a. What is thread? Explain the thread API's techniques for parallel computation. (08 Marks)
b. Differentiate Aneka thread with local thread with diagram. (06 Marks)
c. Explain the programming applications with Aneka thread. (06 Marks)

OR

- 6 a. Explain the features of workflow applications with task dependencies. (10 Marks)
b. List and explain popular framework for task computing. (10 Marks)

Module-4

- 7 a. What is Data Intensive Computing? List all the challenges in data intensive computing and explain each in detail. (10 Marks)
b. Explain Amazon Dynamo architecture that support data intensive applications. (10 Marks)

OR

- 8 a. Explain the following : i) IBM General Parallel File System ii) Google File System
iii) Amazon Simple Storage Service. (10 Marks)
b. Design and Implement an application for log parsing, Mapper and Reducer with Aneka map Reduce. (10 Marks)

Module-5

- 9 a. Describe the core components of Google App Engine. (10 Marks)
b. Explain the Windows Azure platform architecture. (10 Marks)

OR

- 10 a. Discuss in detail the following media applications of cloud computing technologies.
i) Animoto ii) Maya Rendering with Aneka iii) Video encoding on cloud. (12 Marks)
b. Explain in detail about the application of cloud computing in satellite Image processing. (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.

CBCS SCHEME

USN

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

18CS81

Eighth Semester B.E. Degree Examination, July/August 2022 Internet of Things

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. What is Internet of Things (IoT)? Explain Genesis of IoT, with a neat diagram. (08 Marks)
- b. Compare IT and OT Networks with different criterion. (08 Marks)
- c. Explain different challenges faced by IoT. (04 Marks)

OR

- 2 a. Explain One M2M IoT Standardized Architecture, with a neat diagram. (10 Marks)
- b. What is a Fog Node? Explain characteristics of Fog Computing Model. (05 Marks)
- c. Illustrate various access technologies with respect to distances in core IoT functional stack. (05 Marks)

Module-2

- 3 a. Explain any 5 ways to group sensors into different categories. (05 Marks)
- b. List any two advantages of Wireless based solution. Illustrate with a neat diagram, the interaction of Sensors and Actuators, with the Physical World. (07 Marks)
- c. What is a Smart Object? Explain its characteristics. (08 Marks)

OR

- 4 a. Explain the following key factors involved in connecting smart objects to the network :
i) Range ii) Frequency bands. (10 Marks)
- b. Explain IEEE 802.15.4 IoT Access technology. (10 Marks)

Module-3

- 5 a. Explain the key advantages of IP suite for IoT. (05 Marks)
- b. Explain 6 LOWPAN Protocol Header Compression and Fragmentation, with a neat diagram. (08 Marks)
- c. Illustrate Routing Protocol for Low Power and Lossy Networks (RPL), with a neat diagram. (07 Marks)

OR

- 6 a. Explain the message format of the following protocols with a neat diagram :
i) Constrained Application Protocol (CoAP).
ii) Message Queuing Telemetry Transport (MQTT). (10 Marks)
- b. Describe the Scheduling Management Mechanisms and forwarding Models and Supported by 6 TiSCH. (10 Marks)

Module-4

- 7 a. Explain different types of Data Analysis results with example. (08 Marks)
- b. Distinguish between Supervised and Unsupervised Machine Learning. (05 Marks)
- c. Explain Elements of Hadoop, with a neat diagram. (07 Marks)

OR

- 8 a. What is Apache Spark? Explain layers in Lambda Architecture, with a neat diagram. (10 Marks)
b. Explain OCTAVE Allegro steps and phases, with a neat diagram. (10 Marks)

Module-5

- 9 a. Explain the following with respect to Arduino Programming :
i) Structures ii) Functions iii) Variables iv) Flow control statements
v) Data type with example. (10 Marks)
b. Explain the steps to install operating system in the SD card of Raspberry Pi. Write a Python program to blink on LED. (10 Marks)

OR

- 10 a. Explain Key Verticals targeted in Smart Cities, with a neat diagram. (10 Marks)
b. Explain Smart City IoT Architecture, with a neat diagram. (10 Marks)

* * * * *

GBCS SCHEME

USN

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

18CS822

Eighth Semester B.E. Degree Examination, July/August 2022

Storage Area Networks

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 core elements of data centre along with its key characteristics. (10 Marks)
b. Discuss the process of host access to storage. (06 Marks)
c. Write a short note on evolution of storage architecture. (04 Marks)

OR

- 2 a. Explain in detail disk drive components with suitable diagram. (10 Marks)
b. Discuss the concept of DAS with advantages and disadvantages. (06 Marks)
c. Explain disk partitioning and concatenation. (04 Marks)

Module-2

- 3 a. What is RAID? List different RAID levels where parity technique has been adopted. Explain nested RAID, RAID 3, RAID 5 with diagram. (10 Marks)
b. Write a short note on : i) Node ports ii) Cable and connectors. (06 Marks)
c. Discuss RAID impact on disk performance. (04 Marks)

OR

- 4 a. Explain structure of cache with operations. (10 Marks)
b. List and explain RAID techniques. (06 Marks)
c. List types of intelligent storage systems and explain any one in detail. (04 Marks)

Module-3

- 5 a. Write a note on iSCSI and its topologies. (08 Marks)
b. Explain the advantages of NAS. (08 Marks)
c. Compare CIFS and NFS protocols. (04 Marks)

OR

- 6 a. Explain fibre channel protocol stack with neat diagram and write a short note on its performance and security. (08 Marks)
b. Explain NAS components with diagram. (06 Marks)
c. With a neat diagram explain Gateway network attached storage connectivity. (06 Marks)

Module-4

- 7 a. Discuss the life cycle of BC Planning. (10 Marks)
b. List some important BC technology solutions. Explain the failure analysis in BC. (10 Marks)

OR

- 8 a. Describe backup and restore operation. (10 Marks)
b. Write a short note on : i) Backup architecture ii) Backup purpose. (10 Marks)

Module-5

- 9 a. Mention major local replication technologies. Explain network based local replication. (10 Marks)
b. Discuss flushing the file system buffer. (05 Marks)
c. Explain the uses of local Replicas. (05 Marks)

OR

- 10 a. Write a short note on array based synchronous remote replication. (06 Marks)
b. Explain security threats in backup, replication and archive environment. (06 Marks)
c. Write a note on : i) Assets ii) Vulnerability. (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.

CBCS SCHEME

USN

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

18CS823

Eighth Semester B.E. Degree Examination, July/August 2022

NOSQL Database

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. What is NOSQL? Explain briefly about aggregate data models with a neat diagram. Considering example of Relations and Aggregates. (08 Marks)
- b. Briefly describe the value of Relational databases. (07 Marks)
- c. Explain briefly about impedance mismatch, with a neat diagram. (05 Marks)

OR

- 2 a. Write short notes on :
 - i) Consequences of Aggregate Orientation
 - ii) Key – value data model.
 - iii) Document data model
 - iv) Column family stores. (08 Marks)
- b. Explain about graph databases, with a neat diagram. (07 Marks)
- c. What are Schemaless databases? Explain. (05 Marks)

Module-2

- 3 a. What are the distribution models? Briefly explain two paths of data distribution. (10 Marks)
- b. Explain about Update consistency and Read consistency, with an example. (10 Marks)

OR

- 4 a. Write short notes on :
 - i) Single server
 - ii) Combining Sharding and Replication (07 Marks)
- b. Explain the following :
 - i) Relaxing consistency
 - ii) CAP theorem
 - iii) Relaxing Durability
 - iv) Quorums. (08 Marks)
- c. Define Version Stamps. Explain briefly about various approaches of constructing version stamps. (05 Marks)

Module-3

- 5 a. Explain with a neat diagram, the partitioning and combining in Map reduce. (10 Marks)
- b. Explain two stages Map- Reduce example, with a neat diagram. (10 Marks)

OR

- 6 a. Explain Basic Map – Reduce, with a neat diagram. (07 Marks)
- b. How are calculations composed in Map – Reduce? Explain with a neat diagram. (08 Marks)
- c. What are Key value Stores? List out some popular key value database. Explain how all the data is stored in a single bucket of key value data store. (05 Marks)

Module-4

- 7 a. What are Document Databases? Explain with an example. List and explain any 2 features of document databases. (10 Marks)
- b. Elaborate the suitable use cases of document databases. When document databases are not suitable? Explain. (10 Marks)

OR

- 8 a. Briefly explain scaling feature in document databases, with a neat diagram. (10 Marks)
b. Describe some example queries to use with document databases. (10 Marks)

Module-5

- 9 a. What are Graph databases? Explain with example graph structure. (08 Marks)
b. Briefly describe relationships in graph databases, with a neat diagram. (08 Marks)
c. Describe the Query features and transactions of graph databases. (04 Marks)

OR

- 10 a. Explain Scaling and Application level sharding of nodes with a neat diagram. (10 Marks)
b. Explain some suitable usecases of graph databases and describe when we should not use graph databases. (10 Marks)

* * * * *