



**MAHARAJA INSTITUTE OF TECHNOLOGY
THANDAVAPURA**

LIBRARY AND INFORMATION CENTRE

VTU Question Papers

BE - CS

III to VIII Semester

Jun/Jul-2023

2018 & 2021 Scheme

Maharaja Institute of Technology Thandavapura
Just of NH-766,Mysore-ooty highway,Thandavapura(Vill & Post),Nanjangud Taluk,Mysore
District-571302.

INDEX

| Sl.No. | Sub-Code | Subject Title | Exam Date |
|--------|----------|--|----------------|
| 1 | 18MAT31 | Transform Calculus, Fourier Series and Numerical Techniques | Jun/July -2023 |
| 2 | 18CS32 | Data Structures and Applications | Jun/July -2023 |
| 3 | 18CS33 | Analog and Digital Electronics | Jun/July -2023 |
| 4 | 18MAT41 | Complex Analysis , Probability and Statistical Methods | Jun/July -2023 |
| 5 | 18CS45 | Object Oriented Concepts | Jun/July -2023 |
| 6 | 18CS53 | Database Management Systems | Jun/July -2023 |
| 7 | 18CS54 | Automata Theory and Computability | Jun/July -2023 |
| 8 | 18CS55 | Application Development using Python | Jun/July -2023 |
| 9 | 18CS56 | UNIX Programming | Jun/July -2023 |
| 10 | 18CS61 | System Software and Compilers | Jun/July -2023 |
| 11 | 18CS62 | Computer Graphics and Visualization | Jun/July -2023 |
| 12 | 18CS63 | Web Technology and its Application | Jun/July -2023 |
| 13 | 18CS643 | Cloud Computing and Its Applications | Jun/July -2023 |
| 14 | 18CS71 | Artificial Intelligence and Machine Learning | Jun/July -2023 |
| 15 | 18CS72 | Big Data and Analytics | Jun/July -2023 |
| 16 | 18CS743 | Natural Language Processing | Jun/July -2023 |
| 17 | 18CS81 | Internet of Things | Jun/July -2023 |
| 18 | 18CS822 | Storage Area Networks | Jun/July -2023 |
| 19 | 18CS823 | NOSQL Database | Jun/July -2023 |
| 20 | 21MAT31 | Transform Calculus , Fourier Series and Numerical Techniques | Jun/July -2023 |
| 21 | 21CS32 | Data Structures and Applications | Jun/July -2023 |
| 22 | 21CS33 | Analog and Digital Electronics | Jun/July -2023 |
| 23 | 21CS34 | Computer Organization and Architecture | Jun/July -2023 |
| 24 | 21CS42 | Design & Analysis of Algorithms | Jun/July -2023 |
| 25 | 21CS43 | Microcontroller and Embedded Systems | Jun/July -2023 |
| 26 | 21CS44 | Operating System | Jun/July -2023 |

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18MAT31

Third Semester B.E. Degree Examination, June/July 2023 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

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

Module-1

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

OR

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

Module-2

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

OR

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

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

(07 Marks)

Module-3

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

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

- b. Find the Fourier cosine transform of

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

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

OR

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

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

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

Module-4

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

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

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

OR

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

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

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

| | | | | |
|---|---|--------|--------|--------|
| x | 0 | 0.2 | 0.4 | 0.6 |
| y | 0 | 0.0200 | 0.0795 | 0.1762 |

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

Module-5

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

OR

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

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

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

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS32

Third Semester B.E. Degree Examination, June/July 2023 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Explain with block schematic various types of data structures along with examples. Also list out various basic operations that can be performed on data structures. (10 Marks)
- b. Define sparse matrix. Express the given matrix in sparse representation, triplet form and transpose.

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

(10 Marks)

OR

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

Module-2

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

OR

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

Module-3

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

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

(10 Marks)

OR

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

Module-4

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

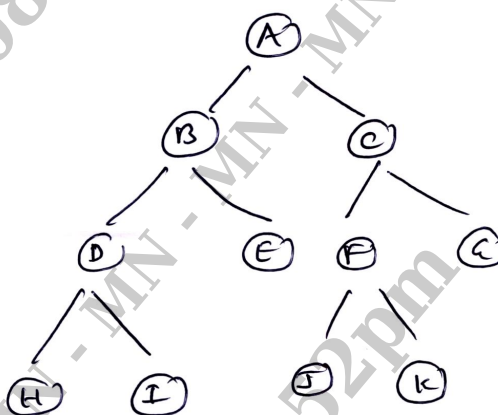


Fig.Q7(a)

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

OR

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



Fig.Q8(a)

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

Module-5

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

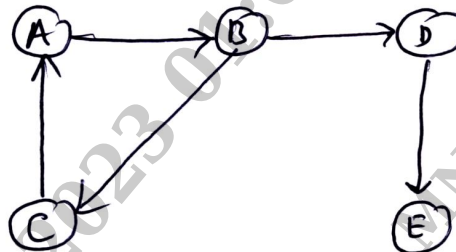


Fig.Q9(a)

- b. Arrange the following elements in ascending order using Radix sort:
 143, 74, 875, 342, 23, 477, 17, 689, 128, 87 (10 Marks)
- OR**
- 10 a. Explain hashing and collision. What are methods to resolve collision? Provide example for each. (10 Marks)
- b. Write algorithm for DFS and BFS traversal for a given graph $G = (V, E)$. (10 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS33

Third Semester B.E. Degree Examination, June/July 2023 Analog and Digital Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

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

OR

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

Module-2

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

Write truth table and use K-map to get simplified expression implement the same using basic gates.

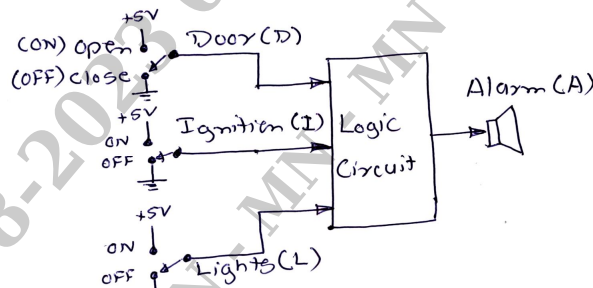


Fig.Q3(a)

- b. Find the minimum sum of product using K-map for each function. (10 Marks)

(i) $f(a, b, c, d) = \pi M(0, 1, 6, 8, 11, 12) \cdot \pi D(3, 7, 14, 15)$

(ii) $f(a, b, c, d) = \sum m(1, 3, 4, 11) + \sum d(2, 7, 8, 12, 14, 15)$

(10 Marks)

OR

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

$F(A, B, C, D) = \sum m(9, 12, 13, 15) + \sum d(1, 4, 5, 7, 8, 11, 14)$

(12 Marks)

Module-3

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

OR

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

Module-4

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

OR

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

Module-5

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

OR

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

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

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

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. Find analytic function $u + iv$, where u is given to be $u = e^x[(x^2 - y^2) \cos y - 2xy \sin y]$. (06 Marks)
- b. Derive Cauchy Reimann equations in polar form. (07 Marks)
- c. Show that $u = e^{2x} [x \cos 2y - y \sin 2y]$ is harmonic. Find the analytic function $f(z) = u + iv$. (07 Marks)

OR

- 2 a. Derive Cauchy Reimann equation in Cartesian form. (06 Marks)
- b. Determine analytic function $f(z) = u + iv$ if $u - v = e^x [\cos y - \sin y]$. (07 Marks)
- c. Show that $w = z^n$ is analytic and hence find its derivative. (07 Marks)

Module-2

- 3 a. Discuss the transformation $w = z + \frac{1}{z}, z \neq 0$. (06 Marks)
- b. Find the Bilinear transformation which maps the points $z = 1, i, -1$ onto $w = 0, 1, \infty$. (07 Marks)
- c. Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along i) line $y = x/2$ ii) real axis to 2 and then vertically to $2 + iy$. (07 Marks)

OR

- 4 a. Discuss the transformation $w = z^2$. (06 Marks)
 - b. State and prove Cauchy's integral formula $f(a) = \frac{1}{2\pi i} \int_C \frac{f(z)}{(z-a)} dz$. (07 Marks)
 - c. Evaluate using Cauchy's integral formula. (07 Marks)
- $$\int_C \frac{e^{2z}}{(z-1)(z-2)} dz \quad C: |z| = 3.$$

Module-3

- 5 a. Define: i) Random variable ii) Discrete probability distribution with an example. (06 Marks)
- b. The probability that man aged 60 will live upto 70 is 0.65. What is the probability that out of 10 men, now aged 60 i) Exactly 9 ii) atmost 9 iii) Atleast 7 will live up to age of 70 years. (07 Marks)
- c. In a normal distribution, 3% of items are under 45 and 8% are over 64. Find the mean and standard deviation, given that $A(0.5) = 0.19$ and $A(1.4) = 0.42$. (07 Marks)

OR

- 6 a. The probability distribution of a finite random variable X is given by

| | | | | | | |
|--------|-----|----|-----|----|-----|---|
| X : | -2 | -1 | 0 | 1 | 2 | 3 |
| P(x) : | 0.1 | K | 0.2 | 2K | 0.3 | K |

Find 'K', mean and variance of X.

(06 Marks)

- b. If probability of bad reaction from certain injection is 0.001. Determine the chance that out of 2000 individuals more than two will get bad reaction, and less than two will get bad reaction.

(07 Marks)

- c. The frequency of accidents per shift in a factory is shown in the following table:

| | | | | | |
|---------------------|-----|-----|----|---|---|
| Accidents per shift | 0 | 1 | 2 | 3 | 4 |
| Frequency | 192 | 100 | 24 | 3 | 1 |

Calculate mean numbers of accidents per shift. Find the corresponding Poisson distribution.

(07 Marks)

Module-4

- 7 a. Fit a second degree parabola
- $y = a + bx + cx^2$
- for the following data:

| | | | | | | |
|---|---|---|---|---|----|----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 1 | 3 | 7 | 3 | 21 | 31 |

(06 Marks)

- b. Find the coefficient of correlation, lines of regression of x on y and y on x. Given,

| | | | | | | | |
|---|---|---|----|----|----|----|----|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| y | 9 | 8 | 10 | 12 | 11 | 13 | 14 |

(07 Marks)

- c. If
- θ
- is an acute angle between line of regression, then show that
- $\tan \theta = \frac{\sigma_x}{\sigma_y} \left(\frac{1-r^2}{r} \right)$
- .

Indicate the significance of the cases $r = 0$ and $r = \pm 1$.

(07 Marks)

OR

- 8 a. Fit the curve of the form
- ax^b
- and hence estimate y when
- $x = 8$
- .

| | | | | | | | |
|---|------|------|------|------|------|------|------|
| x | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| y | 2.76 | 3.17 | 3.44 | 3.64 | 3.81 | 3.95 | 4.07 |

(06 Marks)

- b. Find the rank correlation coefficient for the following data:

| | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|
| x | 93 | 44 | 53 | 08 | 71 | 81 | 6 | 10 | 32 | 31 |
| y | 45 | 62 | 12 | 28 | 92 | 84 | 73 | 3 | 51 | 32 |

(07 Marks)

- c. With the usual notations compute
- \bar{x}
- ,
- \bar{y}
- and r from the following lines of regression:

$$y = 0.516x + 33.73 \text{ and } x = 0.512y + 32.52.$$

(07 Marks)

Module-5

- 9 a. The joint probability distribution for following data

| | | | | |
|-------|-----|-----|-----|-----|
| X \ Y | -2 | -1 | 4 | 5 |
| 1 | 0.1 | 0.2 | 0 | 0.3 |
| 2 | 0.2 | 0.1 | 0.1 | 0 |

Determine the marginal distributions of X and Y also calculate $E(x)$, $E(y)$, $COV(xy)$.

(06 Marks)

- b. Define: i) Null hypothesis ii) Confidence limits iii) Type I, Type II errors.

(07 Marks)

- c. The following table gives the distribution of digits in the numbers chosen at random from a telephone directory:

| Digits | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------|------|------|-----|-----|------|-----|------|-----|-----|-----|
| Frequency | 1026 | 1107 | 997 | 966 | 1075 | 933 | 1107 | 972 | 964 | 853 |

Test whether the digits may be taken to occur equally frequently in the directory.

(given $\chi_{0.05}^2 = 16.92$ at $n = 9$).

(07 Marks)

OR

- 10 a. A fair coin is tossed thrice. The random variable X and Y are defined as follows. X = 0 or 1 according as head or tail occurs on first loss, Y = number of heads.
- Determine distribution of X and Y.
 - Joint probability distribution of X and Y.
 - Expectation of X, Y and XY. (06 Marks)
- b. It is claimed that a random sample of 49 tyres has a mean life of 15200km. Is the sample drawn from population whose mean is 15,150km and standard deviation is 200km? Test the significance level at 0.05 level. (07 Marks)
- c. Ten individuals are chosen at random from the population and their height in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that the mean height of universe is 66' (value of $t_{0.05} = 2.262$ for 9.D.F). (07 Marks)

* * * * *

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

Fourth Semester B.E. Degree Examination, June/July 2023 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. What is the need of structure? Explain with suitable examples. (06 Marks)
- b. List and explain any four features of Object Oriented Programming. (08 Marks)
- c. What is an inline function? Develop a C++ inline function to find maximum of two numbers. (06 Marks)

OR

- 2 a. What is the different between array of objects with array within objects. (06 Marks)
- b. Explain the use of scope resolution operator with example program. (08 Marks)
- c. List out the difference between procedure oriented programming with object oriented programming. (06 Marks)

Module-2

- 3 a. Define friend function. Illustrate with an example program. (06 Marks)
- b. List and explain java buzz word. (06 Marks)
- c. Write the program to calculate the average among the elements {4, 5, 7, 8} using for each in Java. Also show how for each is different from for loop. (08 Marks)

OR

- 4 a. List the characteristics of constructor. Implement a C++ program to define suitable parameterized constructor with default values for the class distance with data members feet and inches. (08 Marks)
- b. What is nested class? Explain the use of nested class with suitable example program. (06 Marks)
- c. What is namespace? Explain with suitable example. (06 Marks)

Module-3

- 5 a. Define inheritance and also define multilevel hierarchy with an example. (10 Marks)
- b. Define "this" keyword and explain with example program. (04 Marks)
- c. Define exception. Write a program with IllegalAccessException. Use proper exception handler so that exception should be printed. (06 Marks)

OR

- 6 a. Illustrate method overriding. Explain the rules to be followed while overriding a method. (08 Marks)
- b. Write the difference between throw and throws keyword with suitable example Java program. (08 Marks)
- c. Explain the use of "Super" keyword with example Java program. (04 Marks)

Module-4

- 7 a. Define Thread. Demonstrate thread priorities in Java with example program. (10 Marks)
b. Briefly explain the role of interfaces while implementing multiple inheritance in Java. (05 Marks)
c. Demonstrate different levels of access protection available for package and their implications. (05 Marks)

OR

- 8 a. Demonstrate the role of synchronization in producer and consumer problem. (10 Marks)
b. Define package and also explain the steps involved in creating user defined packages with an example program. (06 Marks)
c. Explain the two ways of creating thread in Java. (04 Marks)

Module-5

- 9 a. Develop a swing applet that has four checkbox items like C, C++, Java and Python. When anyone of the checkbox item is selected, it should display "C checked", "C++ checked and so on. (10 Marks)
b. Build JLabel and ImageIcon with example Java program. (06 Marks)
c. Explain adapter class with an example. (04 Marks)

OR

- 10 a. Explain the following with an example for each and syntax:
i) JLabel (10 Marks)
ii) JComboBox
iii) JTextField
iv) JButton
b. Illustrate JTable with suitable example. (06 Marks)
c. Describe two key features of SWING program. (04 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS53

Fifth Semester B.E. Degree Examination, June/July 2023 Database Management Systems

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, describe “Three Schema Architecture” and “Data Independence”. (06 Marks)
- b. Discuss the different types of user friendly interfaces and the types of user who typically use each. (06 Marks)
- c. With a neat diagram, explain the component modules of DBMS and their interactions. (08 Marks)

OR

- 2 a. Explain with the block diagram, the different phases of database design. (06 Marks)
- b. Draw an ER diagram of Banking Database. Assume your own entities (minimum 4) , attributes and relationships. Specify 3NF tables. (14 Marks)

Module-2

- 3 a. Briefly discuss different type of update operations on relational database. Show an example of a violation of the referential and entity integrity in each of the update operation. (08 Marks)
- b. Consider the two tables. Show the result of the following :

| T ₁ | | |
|----------------|---|---|
| A | B | C |
| 10 | a | 5 |
| 15 | b | 8 |
| 25 | a | 6 |

| T ₂ | | |
|----------------|---|---|
| P | Q | R |
| 10 | b | 6 |
| 25 | c | 3 |
| 10 | b | 5 |

i)

$$T_1 \bowtie T_2$$

$T_1.B = T_2.Q$

ii)

$$T_1 \bowtie T_2$$

$T_1.A = T_2.P$

iii)

$$T_1 \bowtie T_2$$

$(T_1.A = T_2.P) \text{ AND } (T_1.C = T_2.R)$

iv)

$$T_1 - T_2$$

- c. List and explain the characteristics of Relations. (08 Marks)

(04 Marks)

OR

- 4 a. Define the following :
 - i) Primary key
 - ii) Super key
 - iii) Foreign key
 - iv) Candidate key.(04 Marks)
- b. Discuss all the forms of ALTER Commands with example. (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.

- c. Consider the following tables :
- Works (Pname , Cname , Salary)
 - Lives (Pname , Street , City)
 - Located – in (Cname , City)
- Write the following queries in Relational algebra :
- i) List the names of the people who work for the Company 'Wipro' along with the cities they live in.
 - ii) Find the names of the persons who do not work for 'Infosys'.
 - iii) Find the people whose salaries are more than that of all of the 'Oracle' employees.
 - iv) Find the persons who works and lives in the same City.
 - v) Find the names of the companies that are located in every city where the Company Infosys is located. **(10 Marks)**

Module-3

- 5 a. Describe the six clauses in the syntax of an SQL retrieval query. Show what type of constructs can be specified in each of six clauses. Which of the six clauses are required and which are optional? **(04 Marks)**
- b. How are Triggers and Assertions defined in SQL? Explain. **(06 Marks)**
- c. Consider the following tables :
- Branch (Bname , Bcity , Assets)
 - Account (Accno , Bname , Accbal)
 - Loan (Loan no , Bname , LoanAmt)
 - Customer (Cname , Cstreet , CCity)
 - Depositor (Cname , Accnum)
 - Borrow (Cname , Loannum)
- Write the following queries in SQL :
- i) Find all loan numbers for loans made at cantonment branch with loan amounts greater than 20000.
 - ii) Find the names of all customers whose street address includes 'Main'.
 - iii) Find the average balance for each branch, if average balance is greater than 12000.
 - iv) Find the Customers who have an account, at all the branches located in "Mysure".
 - v) Find all Customers who do not have loan at the bank, but do have an account. **(10 Marks)**

OR

- 6 a. How is view created and dropped? What problems are associated with updating view? **(06 Marks)**
- b. What is Cursor? With program segment, explain retrieving of tuples with embedded SQL in C. **(06 Marks)**
- c. Explain the concept of Create , Passing parameter , Call stored procedure from JDBC. **(08 Marks)**

Module-4

- 7 a. Briefly explain the informal design guidelines used as measure to determine the quality of relations schema design. **(08 Marks)**
- b. What do you mean by Closure of Attributes? Write an algorithm to find closure of attributes. **(06 Marks)**
- c. Given below are two set of FDs for a relation R(A, B, C, D, E). Are they equivalent?
- i) $A \rightarrow B$, $AB \rightarrow C$, $D \rightarrow AC$, $D \rightarrow E$
 - ii) $A \rightarrow BC$, $D \rightarrow AE$. **(06 Marks)**

OR

- 8 a. What do you mean by Multivalued Dependency? Explain the 4NF with example. (06 Marks)
 b. Define First, Second and Third Normal forms by taking an example. (06 Marks)
 c. Consider the following Relation $R(A, B, C, D, E, F, G, H, I, J)$ with
 FDs $\{A, B\} \rightarrow C$, $A \rightarrow \{D, E\}$, $D \rightarrow J$, $B \rightarrow \{F, G\}$, $F \rightarrow \{H, I\}$.
 How would you Normalize completely? (08 Marks)

Module-5

- 9 a. Describe the problems that occur when concurrent execution uncontrolled. Give examples. (06 Marks)
 b. Explain the transaction support in SQL. (06 Marks)
 c. Consider the three transactions T_1 , T_2 and T_3 and schedule S_1 & S_2 given below. Determine whether each schedule is serializable or not? If serializable, write down the equivalent serial schedule (S).
 T_1 : $R_1(x)$, $R_1(z)$, $W_1(x)$;
 T_2 : $R_2(x)$, $R_2(y)$, $W_2(z)$, $W_2(y)$;
 T_3 : $R_3(x)$, $R_3(y)$, $W_3(y)$;
 S_1 : $R_1(x)$, $R_2(z)$; $R_1(z)$; $R_3(x)$; $R_3(y)$; $W_1(x)$; $W_3(y)$; $R_2(y)$; $W_2(z)$; $W_2(y)$;
 S_2 : $R_1(x)$; $R_2(z)$; $R_3(x)$; $R_1(z)$; $R_2(y)$; $W_1(x)$; $W_2(z)$; $W_3(y)$; $W_2(y)$; (08 Marks)

OR

- 10 a. What is Schedule? Explain Conflict and view Serializability schedule with example. (08 Marks)
 b. Briefly discuss the two phase locking protocol used in concurrency control. (06 Marks)
 c. Briefly explain ARIES recovery process. (06 Marks)

* * * * *

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

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

- 1 a. Define the following terms with example
 i) Alphabet ii) Power of an alphabet iii) Language (06 Marks)
- b. With a neat diagram, explain a hierarchy of language classes in automata theory. (04 Marks)
- c. Define deterministic finite state machine. Design DFSM
 i) To accept strings having odd number of a's and odd number of b's
 ii) To accept strings having number of a's divisible by 5 and number of b's divisible by 3. (10 Marks)

OR

- 2 a. Convert the following NDFSM [Refer Fig Q2(a)] to its equivalent DFSM.

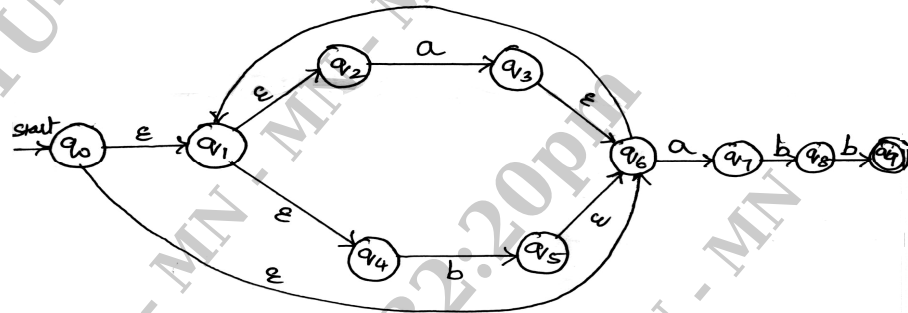


Fig Q2(a)

(10 Marks)

- b. Define distinguishable and indistinguishable states minimize the following DFSM shown in

Table Q2(b)

| δ | a | b |
|----------|---|---|
| → A | B | E |
| B | C | F |
| * C | D | H |
| D | E | H |
| E | F | I |
| * F | G | B |
| G | H | B |
| H | I | C |
| * I | A | E |

(10 Marks)

Module-2

- 3 a. Define regular expression. Obtain a regular expression for the following :
 - i) $L = \{a^n b^m \mid n \geq 4, m \leq 3\}$
 - ii) $L = \{w : n_a(w) \bmod 3 = 0 \text{ where } w \in (a, b)^*\}$
 - iii) $L = \{w : \text{strings ends with } ab \text{ or } ba \text{ where } w \in \{a, b\}^*\}$
 - iv) $L = \{a^{2n} b^{2m} \mid n \geq 0, m \geq 0\}$

(10 Marks)

- b. Consider the DFSM shown below

| States | 0 | 1 |
|------------------|----------------|----------------|
| → q ₁ | q ₂ | q ₁ |
| q ₂ | q ₃ | q ₁ |
| * q ₃ | q ₃ | q ₂ |

Obtain the regular expression $R_{ij}^{(0)}$, $R_{ij}^{(1)}$ and simplify the regular expression as much as possible. (10 Marks)

OR

- 4 a. Using Kleen's theorem, prove that only language that can be defined with a regular expression can be accepted by source FSM. (10 Marks)
 b. State and prove pumping lemma for regular language and show that the language $L = \{a^i b^j \mid i > j\}$ is not regular. (10 Marks)

Module-3

- 5 a. Define context free grammar. Design CFG for the following language.
 i) $L = \{0^i 1^j \mid i \neq j, i \geq 0, j \geq 0\}$ ii) $L = \{a^n b^m \mid n \geq 0, m > n\}$ (10 Marks)
 b. Define Ambiguity consider the grammar
 $E \rightarrow E + E \mid E - E \mid E * E \mid E / E \mid a / b$
 Find Leftmost and Rightmost derivation and parse tree for the string $a + b * a + b$, show that the grammar is ambiguous. (10 Marks)

OR

- 6 a. Define Chomsky normal form and Greibach normal form. Convert the following grammar to CNF
 $S \rightarrow OA \mid 1B$
 $A \rightarrow OAA \mid 1S \mid 1$
 $B \rightarrow 1BB \mid 0S \mid 0$ (10 Marks)
 b. Define a PDA. Obtain PDA to accept the language $L = \{wcw^R \mid w \in \{a, b\}^*\}$ where w^R is reverse of w by a final state. Draw transition diagram. Write sequence of moves made by PDA to accept the string aabcbaa. (10 Marks)

Module-4

- 7 a. Define Turing machine. Explain with neat diagram the working of a Turing machine model. (06 Marks)
 b. Design turning machine to accept the language $L = \{a^n b^n c^n \mid n \geq 1\}$. Draw the transition diagram and shown the moves made by turing machine for the string aabbcc. (14 Marks)

OR

- 8 a. Explain various technique used for construction of turing machine. (05 Marks)
 b. Explain the following ;
 i) Multitape Turing machine ii) Non-deterministic Turing machine
 iii) Linear bounded automata (15 Marks)

Module-5

- 9 a. Explain halting problem in Turing machine prove that $HALT_{TM} = \{(M, W) \mid \text{The Turing machine } M \text{ halts on input } w\}$ is undecidable. (10 Marks)
 b. Define decidable language prove that DFA is decidable language (A_{DFA} is decidable) (10 Marks)

OR

- 10 a. Explain quantum computers (06 Marks)
 b. Explain Church-Turing Thesis (07 Marks)
 c. Explain post correspondence problem. (07 Marks)

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS55

Fifth Semester B.E. Degree Examination, June/July 2023 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. Demonstrate with example print() , input() and string replication. (06 Marks)
- b. List the salient features of python programming language. (06 Marks)
- c. Explain local and global scope in python programs. Illustrate different scenarios, with an example. (08 Marks)

OR

- 2 a. What are Comparison and Boolean operators? List all the comparison and Boolean operators in python and explain the use of these operators with suitable examples. (06 Marks)
- b. Define a python function with suitable parameters to generate prime number between two integer values m and n (note $n > 0$, $m > 0$ and $m < n$). Suitable error messages should be displayed if the conditions for input values are not followed. (06 Marks)
- c. What is Exception handling? How exceptions are handled in python? Write a python code to solve divide-by-zero error situation. (08 Marks)

Module-2

- 3 a. What is Dictionary in Python? How is it different from list data type? Explain how a for-loop can be used to traverse the keys of the dictionary with an example. (06 Marks)
- b. Write a python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. (06 Marks)
- c. Illustrate the procedure to add Bullets to Wiki Markup with code snippets in python. (08 Marks)

OR

- 4 a. Write python program to create a user defined function to find maximum and minimum letter in string. Also find the length of the string without using inbuilt function. (06 Marks)
- b. With example code, explain join() and split() string methods. (06 Marks)
- c. Discuss the following dictionary methods with examples:
(i) get() (ii) items() (iii) keys() (iv) values() (08 Marks)

Module-3

- 5 a. Describe the following with suitable code snippet:
(i) Greedy and non-greedy pattern matching
(ii) findall() method of Regex object. (08 Marks)
- b. With code snippet, explain saving variables using the shelve module and PPrint Pformat() function. (06 Marks)
- c. Explain the following file operations in Python with suitable examples:
(i) Copying files and folders
(ii) Moving files and folders
(iii) Permanently deleting files and folders (06 Marks)

OR

- 6 a. What is meant by compressing files? Explain reading, extracting and creating ZIP files with code snippet. (08 Marks)
b. List out the different character classes and its representation also regular expression symbol and its meaning. (06 Marks)
c. Explain functions of Shutil Module with examples. (06 Marks)

Module-4

- 7 a. What is class? How do we define class? How to instantiate the class and members are accessed? (08 Marks)
b. Demonstrate pure functions and modifiers with examples. (06 Marks)
c. Explain `__init__` and `__str__` methods with an example. (06 Marks)

OR

- 8 a. Explain operator overloading with example. (08 Marks)
b. Illustrate the concept of inheritance with example. (06 Marks)
c. Define polymorphism. Demonstrate polymorphism with function to find histogram to count the number of times each letter appears in a word and in sentence. (06 Marks)

Module-5

- 9 a. Explain in details how to parse HTML with the Beautiful Soup. (08 Marks)
b. Describe the `getText()` function used for getting full text from a .docx file with example code. (06 Marks)
c. Write a python program to access cell in a worksheet. (06 Marks)

OR

- 10 a. Demonstrate JSON module with python program. (08 Marks)
b. How do we extract, decrypt, copy and encrypt PDF files in Python? (06 Marks)
c. Explain Selenium's web drive methods for finding elements. (06 Marks)

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS56

Fifth Semester B.E. Degree Examination, June/July 2023 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 with neat diagram, architecture of UNIX operating system. (10 Marks)
b. List and explain the salient features of UNIX operating system. (10 Marks)

OR

- 2 a. Explain basic file types in UNIX. What is relative and absolute pathname? (10 Marks)
b. Explain the following commands : (10 Marks)
i) printf ii) passwd iii) date iv) who

Module-2

- 3 a. Which command is used for listing of file attributes? Explain the significance of each field. (10 Marks)
b. With the help of an example, explain grep command with all the options. (10 Marks)

OR

- 4 a. Explain 3 standard redirection files with respect to UNIX OS. (10 Marks)
b. Define shell script. Write menu driven shell script which displays: (10 Marks)
i) Current users of sys. ii) List of files
iii) Today's date iv) Process status
v) Contents of file.

Module-3

- 5 a. Discuss how a program is started and terminated in various ways along with suitable diagram. (10 Marks)
b. Explain UNIX kernel support for process considering parent child relationship, show the related data structures. (10 Marks)

OR

- 6 a. Write a detailed description on wait and waitpid() with suitable programming example. (10 Marks)
b. Explain fork() and vfork() functions with programming example. (10 Marks)

Module-4

- 7 a. Explain implementation of system() function with its prototype. (10 Marks)
b. What are pipes? What are its limitations? Write a program to send data from parent to child over a pipe. (10 Marks)

OR

- 8 a. What is FIFO? With neat diagram, explain client-server communication using FIFO. (10 Marks)
b. Explain setuid and setgid functions with example and explain various ways to change user-ids. (10 Marks)

Module-5

- 9 a. What is daemon process? Explain coding rules with program. (10 Marks)
b. What are signals? Mention different source of signals write a program to setup signal handlers for SIGINT and SIGALRM. (10 Marks)

OR

- 10 a. Discuss how error logging is done by daemon process with suitable diagram. (10 Marks)
b. Explain prototypes of following APIs:
(i) signal
(ii) kill
(iii) alarm
(iv) sigaction (10 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS61

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

- With reference to SIC/XE machine architectures explain instruction formats and addressing modes, clearly indicating the settings of different flag bits. (10 Marks)
 - With an illustrate example, explain the need for a two pass assembler. Explain the data structures used in 2-pass assembler. Mention their functions clearly during pass 1 and pass 2. (10 Marks)

OR

- Generate the complete object program for the following SIC/XE assembly language programs. Assume : CLEAR = B4, LDT = 74, TD = EO, JEQ = 30, TIXR = B8, JLT = 38, RSUB = 4C, LDCH = 50, WD = DC, X = 1, T = 5.

```
WRREC START 105D
CLEAR X
LDT LENGTH
WLOOP TD OUTPUT
JEQ WLOOP
LDCH BUFFER, X
WD OUTPUT
TIXR T
JLT WLOOP
RSUB
OUTPUT BYTE X'O5'
BUFFER RESB 400
LENGTH RESB 2
END WRREC
```

- Explain the absolute loader and Bootstrap loader with algorithm/source code. (10 Marks)

Module-2

- What is a Compiler? Explain the various phases of a compiler with a neat diagram and show the output of each phase for the expression $a = b + c * 25$. Assume all variable are a type float. (10 Marks)
 - Write a note on the commonly used compiler – construction tools. (04 Marks)
 - Describe Input Buffering mechanism with an algorithm for lookahead code with sentinels. (06 Marks)

OR

- Construct the transition diagrams to recognize the tokens given below and explain the same.
i) relop ii) Identifier iii) unsigned numbers (10 Marks)
 - With example, define the operations on languages. (04 Marks)
 - Discuss the issues/errors of lexical analysis and the error recovery actions that can be performed. (06 Marks)

Module-3

- 5 a. What is recursive-decent parsing? Explain with a pseudocode. Take the grammar $S \rightarrow cAd$, $A \rightarrow ab|a$ as an example and trace it for input string $w = cad$. Explain how backtracking can be used for tracing. (10 Marks)
- b. Consider the context free grammar :
 $S \rightarrow SS + | SS * | a$ and string $w = aa + a^*$
- Give the leftmost and rightmost derivation and parse tree for the string
 - Is the grammar ambiguous or unambiguous? Justify your answer
 - Eliminate left Recursion (10 Marks)

OR

- 6 a. With a neat diagram, explain the model of a table driven predictive parser. Write and explain the predictive parsing algorithm. (10 Marks)
- b. Consider the following grammar with terminals $(, [,),]$.
 $S \rightarrow TS | [S] S |)S | \epsilon$
 $T \rightarrow (X)$
 $X \rightarrow TX | [X] X | \epsilon$
- Construct FIRST and FOLLOW sets
 - Construct its LL(1) parsing table
 - Is this grammar LL(1)? (10 Marks)

Module-4

- 7 a. Explain the meta – characters used in regular expression with examples. (10 Marks)
- b. Write a LEX program to recognize and count the number of identifiers in a given input file. Show how the program is compiled and executed. (10 Marks)

OR

- 8 a. What are the ambiguities that arise while evaluating a regular expression? Explain with example. (10 Marks)
- b. Write a YACC program to recognize a valid arithmetic expression that uses operators $+$, $-$, $*$ and $/$. (10 Marks)

Module-5

- 9 a. What is a dependency graph? Give a syntax directed definition for simple type declaration including int and float type. Construct annotated parse tree and dependency graph for the input, float a, b, c. (10 Marks)
- b. Explain synthesized attribute, inherited attribute, S – attributed definition and L- attributed definitions with examples. (10 Marks)

OR

- 10 a. What is a three – address code? explain the different ways of representing three – address codes with examples. (10 Marks)
- b. What is target computer model? Explain the different kinds of instructions and addressing modes available in assembly language or a target machine. (10 Marks)

* * * * *

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS62

Sixth Semester B.E. Degree Examination, June/July 2023 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. What is computer graphics? Mention the list of applications. How they are classified? (06 Marks)
- b. Explain with neat diagram operation of cathode-Ray tubes and shadow-mask CRT. (08 Marks)
- c. Explain the logical organization of the video-controller. (06 Marks)

OR

- 2 a. Write Bresenham's line drawing algorithm. Using Bresenham's algorithm calculate the pixel positions for the screen coordinates (1, 1) and (6, 7). (10 Marks)
- b. Write midpoint circle algorithm. Draw the circle with 8 as radius. (10 Marks)

Module-2

- 3 a. Explain scanline polygon filling algorithm with neat sketches and example. (06 Marks)
- b. With a neat figure explain various polygon types in OpenGL. (06 Marks)
- c. What is concatenation of transformation? Explain the following considered 2D:
 - i) Rotation about a fixed point
 - ii) Scaling about a fixed point. (08 Marks)

OR

- 4 a. Define the following two dimensional transformations translation, rotation, scaling reflection and shearing. Give example for each. (10 Marks)
- b. With a neat figure explain two dimensional viewing pipeline? Explain OpenGL 2D viewing functions. (10 Marks)

Module-3

- 5 a. Explain window to view port coordinate transformation. (04 Marks)
- b. Explain the Cohen Sutherland line clipping algorithm considering are all cases. (08 Marks)
- c. With an example explain Sutherland Hodgeman polygon clipping algorithm. (08 Marks)

OR

- 6 a. Discuss the OpenGL functions for the following 3D dimensional transformations:
 - i) Translation
 - ii) Scaling
 - iii) Rotation. (06 Marks)
- b. Explain the following color models:
 - i) RGB color model
 - ii) CMY color model. (08 Marks)
- c. Explain the basic illumination models. (06 Marks)

Module-4

- 7 a. What is three dimensional viewing? Explain three dimensional viewing pipeline with neat diagram. (08 Marks)
- b. Explain OpenGL three dimensional viewing functions, with example for each:
i) gluLookAt ii) glOrtho iii) glPerspective iv) glFrustum. (12 Marks)

OR

- 8 a. Explain classification of visible surface detection and back face detection algorithm. (08 Marks)
- b. Explain Z-buffer or depth buffer algorithm for visible surface detection. (06 Marks)
- c. Discuss OpenGL visibility-detection functions with an example. (06 Marks)

Module-5

- 9 a. List and explain the various classes of logical input devices that are supported by OpenGL. With suitable diagrams, explain various input modes. (10 Marks)
- b. Explain how keyboard, window and mouse events are recognized by GLUT. Give suitable example. (10 Marks)

OR

- 10 a. How pop-up menus are created using GLUT? Illustrate with an example. (06 Marks)
- b. What are the features of a good interactive program? What are the advantages of double buffering? Explain. (08 Marks)
- c. Explain Bezier cubic curves. Give the properties of Bezier curves. (06 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS63

Sixth Semester B.E. Degree Examination, June/July 2023 Web Technology and its Application

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 structure of HTML document with an example. (10 Marks)
b. Explain ordered and unordered list in HTML5 with code. (10 Marks)

OR

- 2 a. Explain embedded style sheet and external style sheet with code. (10 Marks)
b. Discuss class selector and id selector with code. (10 Marks)

Module-2

- 3 a. List and describe different button controls. (08 Marks)
b. Explain the elements used to define the structure of HTML table. Give an example of table. (12 Marks)

OR

- 4 a. What is normal flow in the context of CSS? (10 Marks)
b. What is responsive design? What are its four components, explain them. (10 Marks)

Module-3

- 5 a. With diagrams, explain client script and server script execution. (10 Marks)
b. Explain the php module in the apache and describe the difference between multi-threaded and multi-process setup. (10 Marks)

OR

- 6 a. Describe different comparison operators in javascript. (12 Marks)
b. What is DOM? Briefly explain the different types of nodes. (08 Marks)

Module-4

- 7 a. Describe polymorphism and data encapsulation in php. (10 Marks)
b. Highlight the techniques for reading and writing of files in php with example. (10 Marks)

OR

- 8 a. What are errors and exceptions? (10 Marks)
b. Discuss \$ - SERVER array. How is it used? (10 Marks)

Module-5

- 9 a. What are cookies? Explain php mechanism for writing and reading cookies with example. (10 Marks)
b. Discuss strategies to caching web applications. (10 Marks)

OR

- 10 a. What is AJAX? Explain how asynchronous request is handled using UML diagrams. (10 Marks)
b. Describe how XML is processed in javascript and php. (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, June/July 2023 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. Define cloud computing. Explain its characteristics and benefits. (06 Marks)
b. List and explain pro's and con's of virtualization. (06 Marks)
c. Explain the following :
i) Amazon web services
ii) Microsoft Azure. (08 Marks)

OR

- 2 a. Explain with neat diagram, Type – I and Type – II hypervisor. (06 Marks)
b. List and explain the different various cloud competing platforms and technologies. (06 Marks)
c. With the help of neat diagram, explain the cloud computing reference model. (08 Marks)

Module-2

- 3 a. What is Iaas? Explain its reference implementation with neat diagram. (10 Marks)
b. Explain hardware and software stack of private cloud. List any 2 advantages of using private cloud interface. (10 Marks)

OR

- 4 a. Explain the different services located in the Aneka Container. (10 Marks)
b. Explain with the neat diagram, logical organization of the Aneka cloud. (10 Marks)

Module-3

- 5 a. What are the two major technique used to define parallel implantation of computer algorithm? Explain. (06 Marks)
b. Describe how to implement a parallel matrix scalar product by using domain decomposition. (06 Marks)
c. Define thread? Explain the relation between process and thread with suitable diagram. (08 Marks)

OR

- 6 a. Explain Aneka thread application model with simple Application. (08 Marks)
b. Define task. Explain the computing categories that relate to task. (06 Marks)
c. Explain MPI program structure with neat diagram. (06 Marks)

Module-4

- 7 a. What is data intensive computing? What are the open challenges in the data intensive computing? (06 Marks)
b. Discuss the features of Google file system and Amazon Simple Storage Service (S3). (06 Marks)
c. Explain with a reference scenario, the characteristics and applications of data grid. (08 Marks)

OR

- 8 a. What does the term NOSQL mean? Explain Google bigtable with its architecture. (06 Marks)
b. Explain Mapreduce execution Service of Aneka with a neat diagram. (06 Marks)
c. Explain the following Mapreduce similar framework.
i) Pig ii) Hive iii) Hadoop. (08 Marks)

Module-5

- 9 a. Explain the various storage and communication services provided by AWS. (08 Marks)
b. With a neat diagram, explain the Google AppEngine platform architecture. (06 Marks)
c. Establish the relationship on how the cloud computing technology can be applied to support ECG monitoring. (06 Marks)

OR

- 10 a. With a detailed inference, explain the CRM and ERP implantation based on cloud computing technologies. (08 Marks)
b. Demonstrate with a neat sketch, the architecture of Windows Azure. (06 Marks)
c. Describe an application of cloud technologies for online gaming. (06 Marks)

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS71

Seventh Semester B.E. Degree Examination, June/July 2023 Artificial Intelligence and Machine Learning

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 Artificial Intelligence? List the applications. (05 Marks)
- b. Solve the 4-gallon water jug problem, writing appropriate production rules. (07 Marks)
- c. Apply A* algorithm and find the most cost effective path from start state A to final state J. (08 Marks)

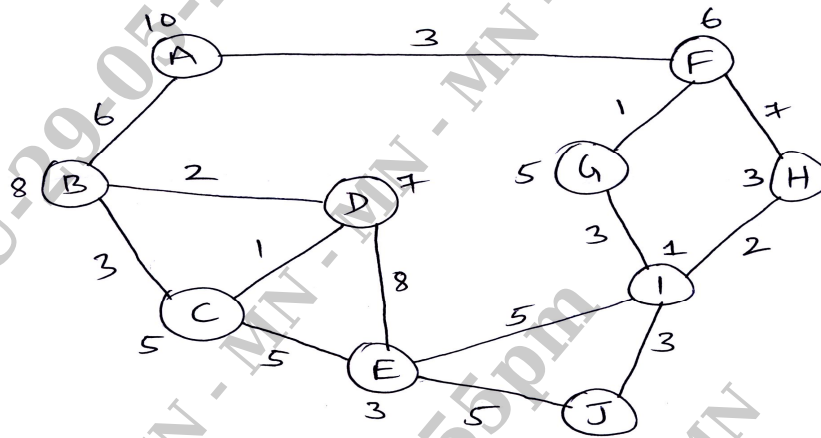


Fig. Q1 (c)

(08 Marks)

OR

- 2 a. What is Heuristic search? Explain the characteristics of heuristic search. (07 Marks)
- b. Provide the solution for water Jug problem by stating the general rules. (07 Marks)
- c. Write the Hill climbing search algorithm of AI. (06 Marks)

Module-2

- 3 a. Discuss the framework of knowledge representation along with any two knowledge representation scheme. (10 Marks)
- b. Explain in brief forward reasoning and backward reasoning. (10 Marks)

OR

- 4 a. Define concept learning. Explain the task of concept learning. (05 Marks)
- b. Write Find-S algorithm. (05 Marks)
- c. Write candidate elimination algorithm. Apply the algorithm for the below dataset to obtain the final version space. (10 Marks)

| Ex | Citations | Size | Inlibrary | Price | Editions | Buy |
|----|-----------|--------|-----------|------------|----------|-----|
| 1 | Some | Small | No | Affordable | One | No |
| 2 | Many | Big | No | Expensive | Many | Yes |
| 3 | Many | Medium | No | Expensive | Few | Yes |
| 4 | Many | Small | No | Affordable | Many | Yes |

(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.

Module-3

- 5 a. Explain the concepts of entropy and information gain in decision tree. (05 Marks)
 b. Apply ID3 algorithm for constructing decision tree for the following training examples. (10 Marks)

| Instances | a_1 | a_2 | a_3 | Classification |
|-----------|-------|-------|--------|----------------|
| 1 | True | Hot | High | No |
| 2 | True | Hot | High | No |
| 3 | False | Hot | High | Yes |
| 4 | False | Cool | Normal | Yes |
| 5 | False | Cool | Normal | Yes |
| 6 | True | Cool | High | No |
| 7 | True | Hot | High | No |
| 8 | True | Hot | Normal | Yes |
| 9 | False | Cool | Normal | Yes |
| 10 | False | Cool | High | Yes |

- c. List and explain the appropriate problems for decision tree learning. (05 Marks)

OR

- 6 a. Apply perceptron rule for implement XOR gate by considering the following and compute the final weights.

Inputs : X_1, X_2

Output : y

Initial weights : $W_{11} = W_{21} = 1$

$W_{12} = W_{22} = 1$

$V_1 = V_2 = 1$

Threshold = 1 and learning rate = 1.5

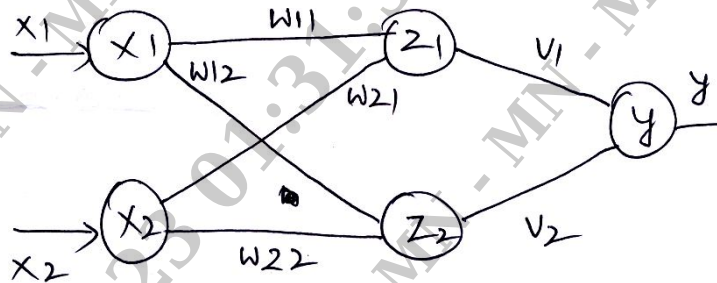


Fig. Q6. (a)

- b. Write Back propagation algorithm. (06 Marks)
 c. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. (07 Marks)

Module-4

- 7 a. Explain Bayes theorem and MAP hypothesis with equations. (06 Marks)
 b. Outline Brute force MAP learning algorithm. (08 Marks)
 c. In Orange country, 51% of the adults are males (other 49% are ofcourse females). One adult is randomly selected for a survey involving credit card usage.
 (i) Find the prior probability that the selected person is male. (06 Marks)
 (ii) It is later learned that the selected survey subject was Smoking a Cigar. Also, 9.5% of males smoke Cigar, whereas 1.7% of females smoke Cigars. Use this additional information to find the probability that the selected subject is a male. (06 Marks)

OR

- 8 a. Discuss the minimum description length algorithm. (07 Marks)
 b. Apply Naïve Bayes classifier for the below dataset to classify the new instances. (Color = Green, Legs = 2, Height = Tall and Smelly = No)

| No. | Color | Legs | Height | Smelly | Species |
|-----|-------|------|--------|--------|---------|
| 1 | White | 3 | Short | Yes | M |
| 2 | Green | 2 | Tall | No | M |
| 3 | Green | 3 | Short | Yes | M |
| 4 | White | 3 | Short | Yes | M |
| 5 | Green | 2 | Short | No | H |
| 6 | White | 2 | Tall | No | H |
| 7 | White | 2 | Tall | No | H |
| 8 | White | 2 | Short | Yes | H |

- c. Explain Gibbs algorithm. (07 Marks)
 (06 Marks)

Module-5

- 9 a. Discuss K-Nearest Neighbor learning algorithm. (08 Marks)
 b. Discuss in brief locally weighted linear regression. (06 Marks)
 c. Explain in brief case based reasoning. (06 Marks)

OR

- 10 a. Explain in brief the reinforcement learning technique. (10 Marks)
 b. Discuss the learning tasks and Q learning in the context of reinforcement learning. (10 Marks)

* * * * *

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS72

Seventh Semester B.E. Degree Examination, June/July 2023 Big Data and Analytics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define big data, and explain its characteristics. (06 Marks)
- b. List and explain different data sources. (04 Marks)
- c. Explain Big data designing architecture. (10 Marks)

OR

- 2 a. Explain the functions of each of the Big Query layers in big data architecture design using Big Query Cloud Service at Google Cloud Platform. (10 Marks)
- b. (i) Explain big data analytics applications. (05 Marks)
- (ii) Write a short note on data storage and analysis. (05 Marks)

Module-2

- 3 a. With a neat diagram, explain the components of HDFS (Hadoop Distribution File System). (10 Marks)
- b. How does the Hadoop MapReduce data flow work for a word count program? Give an example. (10 Marks)

OR

- 4 a. What is APACHE Flume? Describe the feature components and working of apache flume. (10 Marks)
- b. Explain the features and benefits of apache Hive in hadoop. (10 Marks)

Module-3

- 5 a. Discuss NOSQL data architecture pattern, with an example. (10 Marks)
- b. Explain four different ways for handling big data problems. (10 Marks)

OR

- 6 a. (i) Explain different components of Cassandra. (05 Marks)
- (ii) Explain different data types built into Cassandra. (05 Marks)
- b. (i) Describe different CQL commands and their functionalities. (05 Marks)
- (ii) Write a short note on NOSQL to Manage Big Data. (05 Marks)

Module-4

- 7 a. Describe the significance of apache pig in hadoop. (10 Marks)
- b. With a neat diagram, explain MapReduce Programming model. How does MapReduce enables query processing quickly in Big Data Problems? (10 Marks)

OR

- 8 a. Explain Hive architecture with a neat diagram. (10 Marks)
- b. (i) Differentiate between Pig and MapReduce. (05 Marks)
- (ii) Write a short note on Pig architecture design layers. (05 Marks)

Module-5

- 9 a. What are outliers? Describe the reasons for the presence of outliers in a relationship. (10 Marks)
- b. How can a university student's GPA be predicted from his/her – high school percentage (HSP) of marks? (Assume linear regression) Plot a graph for the same. (10 Marks)

OR

- 10 a. Discuss the different phases of text mining process. (10 Marks)
- b. Write a short note on text mining and web mining. (05 Marks)
- c. Discuss three phases for web usage mining. (05 Marks)

* * * * *

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

Seventh Semester B.E. Degree Examination, June/July 2023 Natural Language Processing

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. List and explain the challenges of Natural Language Processing. (08 Marks)
- b. Explain the role of transformational rules in transformational grammar with the help of an example. (08 Marks)
- c. Explain theta theory with suitable example. (04 Marks)

OR

- 2 a. Examine the n-gram model and derive its expression. Also using the bigram model, solve the following test case sentence :
Training Set:
<s> The Arabian Knights </s>
<s> These are the fairy tales of the east </s>
<s> The stories of the Arabian Knights are translated in many languages </s>

Test sentence :
<s> : The Arabian Knights are the fairy tales of the east </s>
Apply the bigram model for the test sentence and estimate the probability. (08 Marks)
- b. Explain the C-structure and f-structure concepts used in language modeling with suitable example. (08 Marks)
- c. Explain the application of Natural Language Processing. (04 Marks)

Module-2

- 3 a. Examine the importance of morphological parsing and explain the two-step morphological parser. (10 Marks)
- b. Explain the minimum edit distance algorithm and compute the minimum edit distance between EXECUTION and INTENTION. (10 Marks)

OR

- 4 a. Explain rule based and stochastic taggers. (10 Marks)
- b. Explain the probabilistic parsing. Also list out its disadvantages. (10 Marks)

Module-3

- 5 a. Explain shortest dependency path hypothesis. Show various shortest dependency path among the relations in the "Jellisc created an atmosphere of terror in the camp by killing abusing and threatening the detainees". (10 Marks)
- b. Explain domain knowledge, domain concepts and knowledge roles with example. (10 Marks)

OR

- 6 a. Explain the learning framework architecture with a neat diagram. (10 Marks)
- b. Explain functional overview of InFact System with a neat diagram. (10 Marks)

Module-4

- 7 a. Explain the Latent Semantic Analysis Feedback System. (10 Marks)
b. Explain the functioning of Word Matching Feedback System. (10 Marks)

OR

- 8 a. With a neat diagram, explain the transitions of a classification transducer. (10 Marks)
b. Explain the evolutionary model for knowledge discovery from texts. (10 Marks)

Module-5

- 9 a. Explain the design features of information retrieval system. (10 Marks)
b. Explain Boolean and Vector space information retrieval models. (10 Marks)

OR

- 10 a. Explain the Cluster and Fuzzy models of information retrieval systems. (10 Marks)
b. Explain Wordnet with its applications. (10 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS81

Eighth Semester B.E. Degree Examination, June/July 2023 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. Define IOT. Explain in detail IOT and digitization. (06 Marks)
- b. Explain in detail with any two example IOT impact. (08 Marks)
- c. Explain the different evolutionary phases of the Internet. (06 Marks)

OR

- 2 a. Explain different challenges of IOT. (04 Marks)
- b. Explain in detail IOT World Forum (IOTWF) Standard Architecture. (08 Marks)
- c. Explain expanded view of the simplified IOT Architecture. (08 Marks)

Module-2

- 3 a. List and explain different types of sensors (any 8) with an example each. (08 Marks)
- b. What are smart objects? With neat diagram, explain characteristics of smart object. (08 Marks)
- c. What are Actuators? Explain comparison of sensors and actuators functionality with human. (04 Marks)

OR

- 4 a. What is SANET? Explain some advantages and disadvantages that a wireless based solution offers. (06 Marks)
- b. Briefly explain protocol stack utilization IEEE 802.15.4. (08 Marks)
- c. List and explain in brief communication criteria. (06 Marks)

Module-3

- 5 a. Explain key advantages of Internet Protocol for the IOT. (08 Marks)
- b. Explain the need for optimization. (08 Marks)
- c. With a neat diagram, explain comparison of an IOT protocol stack utilizing 6LOWPAN and IP protocol stack. (04 Marks)

OR

- 6 a. Write notes on Supervisory Control and Data Acquisition (SCADA). (06 Marks)
- b. Explain with neat diagram Constrained Application Protocol (COAP) message format. (08 Marks)
- c. Explain in detail Message Queuing Telemetry Transport (MQTT) publish/subscribe frame. (06 Marks)

Module-4

- 7 a. Compare: (i) Structured versus unstructured data (ii) Data in motion versus data at rest (06 Marks)
- b. With neat diagram, explain Hadoop distributed cluster and writing a file to HDFS. (08 Marks)
- c. Explain Lambda Architecture. (06 Marks)

OR

- 8 a. Explain edge streaming analytics and functions of Edge Analytics Processing Unit. (10 Marks)
b. Explain in detail formal risk analysis structures. (10 Marks)

Module-5

- 9 a. Write notes on: (i) Arduino UNO (ii) Raspberry Pi (12 Marks)
b. With a neat diagram, explain wireless temperature monitoring system using Raspberry Pi. (08 Marks)

OR

- 10 a. Explain IOT strategy for smarter cities. (10 Marks)
b. With neat smart cities Layered Architecture diagram, explain Smart City IOT Architecture. (10 Marks)

* * * * *

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS822

Eighth Semester B.E. Degree Examination, June/July 2023 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. Define data center. List and explain the key elements of data center. Explain the characteristics of data center elements with diagram. (10 Marks)
- b. Explain with neat diagram the evolution of storage architecture. (06 Marks)
- c. With diagram explain about compute virtualization. (04 Marks)

OR

- 2 a. Explain disk drive components with diagram. (10 Marks)
- b. Discuss disk service time and disk I/O controller utilization. (10 Marks)

Module-2

- 3 a. List the different RAID levels where parity technique has been adopted. Explain any three. (10 Marks)
- b. Different between software and hardware RAID. (04 Marks)
- c. With diagram explain different RAID techniques. (06 Marks)

OR

- 4 a. Explain types of Intelligent storage systems. (10 Marks)
- b. Explain with neat diagram the components of fibre channel storage area networks. (10 Marks)

Module-3

- 5 a. Discuss different iSCSI topologies with neat diagram. (06 Marks)
- b. Briefly explain about iSCSI protocol stack. (04 Marks)
- c. Explain the components of NAS with neat sketch. Briefly explain the benefits of NAS. (10 Marks)

OR

- 6 a. Explain NAS implementations in detail. (06 Marks)
- b. Discuss about NAS file sharing protocols. (04 Marks)
- c. With diagram explain about FCIP protocol stack and FCIP topology. (10 Marks)

Module-4

- 7 a. Describe failure analysis in business continuity. Mention important BC technology solutions. (10 Marks)
- b. With a neat diagram, explain the steps involved in backup and restore operation. (10 Marks)

OR

- 8 a. What is business continuity? Explain the BC terminology in detail. (10 Marks)
- b. Discuss different backup topologies. (10 Marks)

Module-5

- 9 a. Explain FC SAN security architecture and IPSAN security implementations with diagram. (10 Marks)
- b. Explain the following : (10 Marks)
- i) Uses of local replica
 - ii) LVM based replication
 - iii) Full volume mirroring
- OR
- 10 a. Explain storage security domains. (10 Marks)
- b. What is remote replication? Explain storage array based remote replication. (10 Marks)

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

18CS823

Eighth Semester B.E. Degree Examination, June/July 2023 NOSQL Database

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Explain the evolution of databases from object oriented databases to NOSQL databases. (10 Marks)
 - Which data model does not support aggregate orientation? Differentiate between key value and document oriented data models. (05 Marks)
 - Use the above graphical representation and answer the following questions with justification [Refer Fig.Q1(c)] :

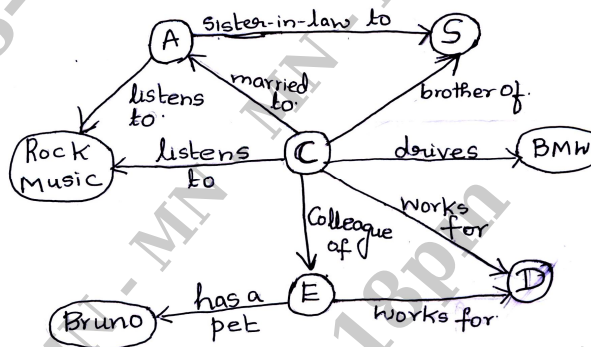


Fig.Q1(c)

- Who listens to rock music and works for D?
 - Who works for D and has a married colleague?
 - Who listen to rock music?
 - How are A and S related to each other and also to C?
 - What are the genders of C and A?
- (05 Marks)

OR

- Define impedance mismatch. Briefly explain the advantages of relational databases. (05 Marks)
 - Define materialized view. How are they different from views? Briefly explain the two main strategies to build a materialized view. (09 Marks)
 - Explain the data arrangement and access in column family data stores with example. (06 Marks)

Module-2

- Compare the similarities and differences between single server and master slave data distribution model. (06 Marks)
 - Identify the type of conflict in the following scenario. How can it be solved? Alice and Bob share a common google sheet Online Both read the file. Alice updates the document and forgets to save the file. On the other end Bob updates the Google sheet and saves the file. The content updated by Alice is overwritten by Bob. The data updated by Alice is lost. (09 Marks)
 - List and explain the approaches through which version stamps can be constructed for a single authoritative source for data models. (05 Marks)

OR

- 4 a. Compare the similarities and difference between sharding and peer to peer data distribution models. (06 Marks)
- b. Define quorum. Explain read quorum and write quorum with examples. (09 Marks)
- c. List and explain the approaches through which version stamps for multiple nodes data models. (05 Marks)

Module-3

- 5 a. Explain Mappers and Reducers with examples. (10 Marks)
- b. Explain the features of Key-value stores. (10 Marks)

OR

- 6 a. Explain partitioning and combining stages with examples. (10 Marks)
- b. Define key-value stores. Explain the data storage in Riak with limitations and solution to overcome the limitation. (05 Marks)
- c. Explain how data can be read and posted from and to the bucket using queries in Riak. (05 Marks)

Module-4

- 7 a. What is document database? Give examples of any document that can be stored into it and explain. (05 Marks)
- b. Explain consistency and availability in MongoDB with neat diagram for configuration of replica sets. (10 Marks)
- c. List and explain briefly the applications of document databases. (05 Marks)

OR

- 8 a. With suitable diagrams, explain
i) horizontal sharding in MongoDB for adding a new node to an existing replica-set.
ii) each shard is a replica set. (08 Marks)
- b. With examples differentiate between queries written in SQL and its equivalent query in Mongo Shell. (08 Marks)
- c. Explain few cases where document databases are not useful. (04 Marks)

Module-5

- 9 a. Explain graph database. With a neat diagram, explain relationships with properties in a graph. (06 Marks)
- b. Explain Query features in detail with examples. (10 Marks)
- c. List and explain use cases where graph databases are very useful. (04 Marks)

OR

- 10 a. With a neat diagram, explain the three ways in which graph databases can be scaled. (10 Marks)
- b. Explain Consistency, Transactions and availability with respect to graph databases. (06 Marks)
- c. With a neat example diagram, explain the terms property, relationships and traversing a graph with a query. (04 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21MAT31

Third Semester B.E. Degree Examination, Jan./Feb. 2023 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Find the Laplace transform of $te^{2t} - \frac{2 \sin 3t}{t}$. (06 Marks)
- b. Given that $f(t) = \begin{cases} E, & 0 < t < a/2 \\ -E, & a/2 < t < a \end{cases}$
where $f(t+a) = f(t)$ show that $L\{f(t)\} = \frac{E}{s} \tanh\left(\frac{as}{4}\right)$. (07 Marks)
- c. Using convolution theorem obtain the inverse Laplace transform of the following function : (07 Marks)
$$\frac{1}{(s-1)(s^2+1)}$$

OR

- 2 a. Find the inverse Laplace transform of : (06 Marks)
$$\frac{s+5}{s^2-6s+13}$$
- b. Express the following function in terms of unit step function and hence find their Laplace transform. (07 Marks)
$$f(t) = \begin{cases} 1, & 0 < t < 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2. \end{cases}$$
- c. Solve the following initial value problem by using Laplace transform : (07 Marks)
$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}, y(0) = 0, y'(0) = 0.$$

Module-2

- 3 a. Obtain Fourier series of $f(x) = \frac{\pi-x}{2}$ in $0 < x < 2\pi$. Hence deduce that (06 Marks)
$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$$
- b. Find a cosine Fourier series for $f(x) = (x-1)^2, 0 \leq x \leq 1$. (07 Marks)
- c. Obtain the Fourier series of y upto the First harmonic 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 | 2.8 | 3.4 |

(07 Marks)

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

OR

- 4 a. Obtain Fourier series for

$$f(x) = \begin{cases} \pi x & \text{in } 0 \leq x \leq 1 \\ \pi(2-x) & \text{in } 1 \leq x \leq 2 \end{cases} \quad (06 \text{ Marks})$$

- b. Obtain the sine half range series for the function :

$$f(x) = 1 - \left(\frac{x}{\pi}\right) \text{ in } 0 \leq x \leq \pi. \quad (07 \text{ Marks})$$

- c. The following values of y and x are given. Find Fourier series of upto first harmonics.

| | | | | | | | |
|---|-----|------|------|------|------|------|-----|
| x | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
| y | 9.0 | 18.2 | 24.4 | 27.8 | 27.5 | 22.0 | 9.0 |

(07 Marks)

Module-3

- 5 a. If
- $f(x) = \begin{cases} 1-x^2, & |x| < 1 \\ 0, & |x| \geq 1 \end{cases}$
- . Find Fourier transform of f(x) and hence find the value of

$$\int_0^{\infty} \frac{x \cos x - \sin x}{x^3} dx. \quad (06 \text{ Marks})$$

- b. Find the Fourier sine transform of
- $f(x) = e^{-|x|}$
- and hence evaluate

$$\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx, \quad m > 0. \quad (07 \text{ Marks})$$

- c. Solve by using Z-Transforms
- $U_{n+2} + 2U_{n+1} + U_n = n$
- with
- $U_0 = 0 = U_1$
- . (07 Marks)

OR

- 6 a. Obtain the Fourier cosine transform of the function :

$$f(x) = \begin{cases} 4x, & 0 < x < 1 \\ 4-x, & 1 < x \leq 4 \\ 0, & x > 4. \end{cases} \quad (06 \text{ Marks})$$

- b. Obtain the Z-transform of
- $\cos n\theta$
- and
- $\sin n\theta$
- (07 Marks)

- c. Compute the inverse Z-transform of
- $\frac{3z^2 + 2z}{(5z+1)(5z+2)}$
- . (07 Marks)

Module-4

- 7 a. Classify the following partial differential equations :

i) $x^2 u_{xx} + (1-y^2) u_{yy} = 0, \quad -\infty < x < \infty, -1 < y < 1$

ii) $(1+x^2) u_{xx} + (5+2x^2) u_{xt} + (4+x^2) u_{tt} = 0$

iii) $(x+1) u_{xx} - 2(x+2) u_{xy} + (x+3) u_{yy} = 0. \quad (10 \text{ Marks})$

- b. Solve
- $u_t = u_{xx}$
- subject to the conditions
- $u(0, t) = 0 = u(1, t)$
- and
- $u(x, 0) = \sin(\pi x)$
- by taking
- $h = 0.2$
- for 5 levels. Further write down the following values from the table

i) $u(0.2, 0.04)$

ii) $u(0.4, 0.08)$

iii) $u(0.6, 0.06).$

(10 Marks)

OR

- 8 a. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square Mesh with boundary values as shown. Find the iterative values of u_i (1 to 9) to the nearest integer.

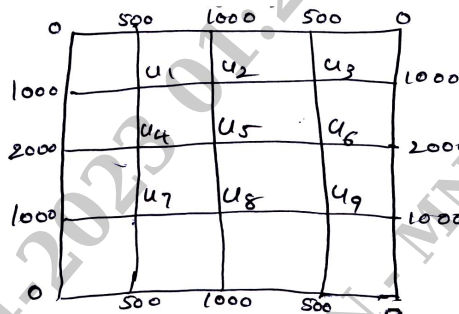


Fig.Q8(a)

- (10 Marks)
- b. Solve $25u_{xx} = u_{tt}$ at the pivotal points given $u(0, t) = 0 = u(5, t)$, $u(x, 0) = 0$ and $u(x, 0) = \begin{cases} 20x, & 0 \leq x \leq 1 \\ 5(5-x), & 1 \leq x \leq 5 \end{cases}$ by taking $h = 1$ compute $u(x, t)$ for $0 \leq t \leq 1$. (10 Marks)

Module-5

- 9 a. Given $y'' - xy' - y = 0$ with the initial conditions $y(0) = 1$, $y'(0) = 0$ compute $y(0.2)$ using fourth order Runge - Kutta method. (06 Marks)
- b. Derive the Euler's equation. (07 Marks)
- c. Find the extremal of the functional. (07 Marks)
- $$\int_{x_1}^{x_2} (y^2 + y'^2 + 2ye^x) dx.$$

OR

- 10 a. Obtain the solution of the equation $2 \frac{d^2 y}{dx^2} = 4x + \frac{dy}{dx}$ by computing the value of $y(1.4)$ by applying Milne's method using following data :

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

- (06 Marks)
- b. Find the curve on which the functional $\int_0^1 [(y')^2 + 12xy] dx$ with $y(0) = 0$ and $y(1) = 1$ can be determined. (07 Marks)
- c. Prove that the shortest distance between two points in a plane is straight line. (07 Marks)

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21CS32

Third Semester B.E. Degree Examination, June/July 2023 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Define data structures. Classify data structures in various features. (06 Marks)
 - Write algorithms to insert a data element into array and delete an element from the array. (07 Marks)
 - Explain various memory allocation and de-allocation function supported in C. (07 Marks)

OR

- Explain user defined structures with respect to C. Give structure definition and declaration for STUDENT data with the following information: USN and Name. Also give self referential structure. (04 Marks)
 - Show array representation of two polynomials. Write a C function to add two polynomials A(x) and B(x) term by term to produce D(x) where $D(x) = A(x) + B(x)$, $A(x) = 2x^{10} + x + 3$, $B(x) = x^5 + 10x^3 + 3x^2 + 12$. (08 Marks)
 - Obtain triplet representation for the given sparse matrix. Write fast transpose algorithm to obtain transpose of sparse matrix.

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

(08 Marks)

Module-2

- How recursion uses stack during its execution. Give algorithm to simulate Tower of Hanoi. Trace the algorithm for a total of 3 disc which are placed in source pole. (06 Marks)
 - Write C routines to implement operations on stack. Also incorporate useful routines to check the stack status for full and empty. Also include global declarations. (07 Marks)
 - Write algorithm to convert infix expression to prefix form. Apply the algorithm to obtain equivalent prefix form. Infix expression : $6 * 2 \wedge 2 \wedge 3 / (9 - 3)$ (07 Marks)

OR

- Design circular queue using dynamically allocated arrays. Give steps to relocate elements in dynamic array for proper insertion and deletion. (04 Marks)
 - With the help of algorithm, evaluate the postfix expression $6223 \wedge \wedge * 3 /$ using stack. (08 Marks)
 - What is the advantage circular queue over ordinary queue? Give ADT to perform various operations on circular queue. Also give ADTs to check for empty and full. (08 Marks)

Module-3

- 5 a. Give structure representation in C to create a single linked list. Give C routine to implement following operations on SLL:
 (i) Create SLL of integer data
 (ii) Insert a node at rear end
 (iii) Delete a node from front end
 (iv) Display all nodes neatly
 (v) Search for a suitable data in SLL and display appropriate message. **(12 Marks)**
- b. What is the advantage of doubly linked list? Give suitable steps to insert a node between A and B (consider A is NULL, B is NULL and A & B are not NULL) in SLL. **(08 Marks)**

OR

- 6 a. Write the node representation of the linked representation of a polynomial. Also give algorithm to perform addition on two polynomials. **(10 Marks)**
- b. Differentiate between SLL, DLL, circular linked list and header linked list. Give algorithm to insert a node circular linked list and traverse the list. **(10 Marks)**

Module-4

- 7 a. Define tree. For the given tree, explain terminologies and write the answer:
 (i) Degree (ii) Non terminal (iii) Sibling
 (iv) Ancestor (v) Level (vi) Height

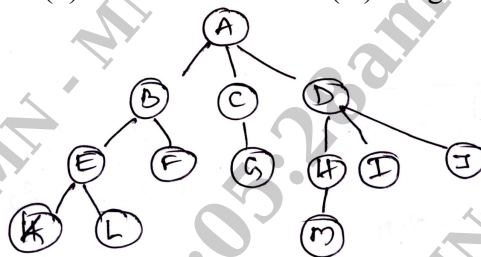


Fig.Q7(a)

- b. Give C routine to create BST for the data 12, 0, -90, 5, 3, 10, 0, 8, 18. Give 3 traversals of BST constructed from above data. **(07 Marks)**
- c. Given in order sequence DJHBEAFICG and post order sequence JHDEBIFGCA, construct binary tree and give pre-order traversal. **(07 Marks)**

OR

- 8 a. Give array and linked list representation for the binary tree.

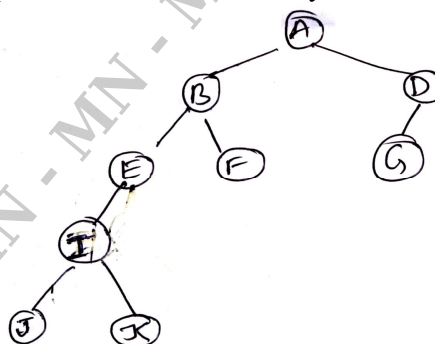


Fig.Q8

- b. Write iterative and recursive search function to search a key in BST. **(08 Marks)**
- c. Draw a binary tree for the following expression $3 + 4 * (7 - 6) / 4 + 3$. Traverse the tree and obtain pre-order and post order expression. **(06 Marks)**

Module-5

- 9 a. For the given graph show adjacency matrix and adjacency list representation.

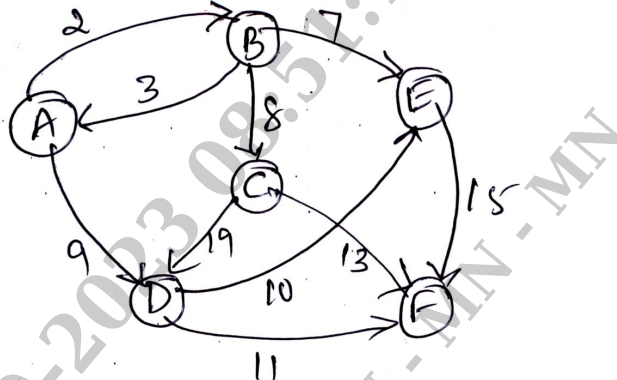


Fig.Q9(a)

- b. Write BFS and DFS algorithm for graph traversal. (06 Marks)
 c. Write a note on AVL tree. (10 Marks)
 (04 Marks)
- OR**
- 10 a. What is hashing? Explain different hashing function with suitable numerical example. (08 Marks)
 b. What is collision? Explain the method to resolve collision with suitable algorithm of linear probing. Insert keys 72, 27, 36, 24, 63, 81, 92, 101 into table [size = 10]. (08 Marks)
 c. Write a note on B-tree. (04 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21CS33

Third Semester B.E. Degree Examination, June/July 2023 Analog and Digital Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With a neat diagram and mathematical analysis explain fixed bias circuit. (06 Marks)
- b. With hysteresis characteristics explain the working of Inverting Schmitt trigger. (06 Marks)
- c. Explain current to voltage and voltage to current convertor. (08 Marks)

OR

- 2 a. Discuss Regulated power supply parameters. (06 Marks)
- b. Explain the working of R-2R ladder D to A convertor. (06 Marks)
- c. Explain successive approximation A to D convertor. (08 Marks)

Module-2

- 3 a. Minimize the following function using K-map and implement it using basic gates.
 $f(A, B, C, D) = \sum m(0, 1, 2, 5, 7, 8, 9, 10, 13, 15)$ (06 Marks)
- b. Simplify the following function using Quine McClusky method.
 $f(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 10, 12, 13, 15)$ (08 Marks)
- c. Minimize the following function for POS using K-map and realize using basic gains
 $f(a, b, c, d) = \pi M(0, 1, 6, 8, 11, 12) + d(3, 7, 4, 15)$ (06 Marks)

OR

- 4 a. With an example explain Petrick's method. (06 Marks)
- b. Simplify the following function using Quine – McClusky method
 $f(A, B, C, D) = \sum m(2, 3, 7, 9, 11, 13) + \sum d(1, 10, 15)$ (08 Marks)
- c. With the help of flow chart explain how to determine minimum sum of products using Karnaugh map. (06 Marks)

Module-3

- 5 a. Explain with neat diagram static 'O' hazard and how Static-O hazard can be detected and removed with example. (08 Marks)
- b. What is multiplexer, explain 8-to-1 multiplexer with the help of logic diagram and corresponding expression. (06 Marks)
- c. Explain with a neat diagram 3:8 decoder. (06 Marks)

OR

- 6 a. Implement the following function using PLA.
 $f_1(a, b, c) = \sum m(0, 4, 6, 7)$
 $f_2(a, b, c) = \sum m(4, 6)$ (06 Marks)
- b. Explain seven segment decoder and realize using PLA. (10 Marks)
- c. Explain simulation and testing of digital circuits. (04 Marks)

Module-4

- 7 a. Explain structure of VHDL program. Write VHDL code for 4 bit parallel adder using full adder as component. (08 Marks)
b. Explain the working of SR latch using NOR gates. (06 Marks)
c. Explain edge triggered D flip flop. (06 Marks)

OR

- 8 a. Explain J-K Master slave flip flop with suitable timing diagram. (10 Marks)
b. Derive the characteristics equations for D, T, SR and JK flip flops. (10 Marks)

Module-5

- 9 a. What is shift register? Explain the works of 8-bit SISO using SR flip flop with Timing diagram. (10 Marks)
b. With a block diagram explain the working of n bit parallel adder with accumulator. (10 Marks)

OR

- 10 a. Explain Three bit binary ripple counter with relevant waveforms and truth table. (10 Marks)
b. Design a random counter using T flip flop for the following sequence: (10 Marks)
000, 100, 111, 010, 011,

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21CS34

Third Semester B.E. Degree Examination, June/July 2023 Computer Organisation and Architecture

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Describe basic operation concepts behind working of computers. (10 Marks)
b. Write a short notes on :
i) Basic Performance Equation ii) Clock Rate (10 Marks)

OR

- 2 a. Describe the concept of Branching with an example program of instruction execution. (10 Marks)
b. Describe various addressing mode with examples. (10 Marks)

Module-2

- 3 a. Explain the interfacing of I/O device with computer. (10 Marks)
b. Describe the concept of Interrupt in computer. (10 Marks)

OR

- 4 a. Explain the Direct Memory Access Technique and its importance. (10 Marks)
b. Explain with neat timing diagram of an input transfer on a synchronous bus. (10 Marks)

Module-3

- 5 a. Explain basic concepts involved for memory structure of computers. (10 Marks)
b. What are various semiconductor memories? Explain in detail the working of Read/Write operation of SRAM. (10 Marks)

OR

- 6 a. Describe the parameters – speed, size and cost with respect to memory. (10 Marks)
b. What is a virtual memory? Explain its role. (10 Marks)

Module-4

- 7 a. Explain how a fast adder is designed. (10 Marks)
b. Multiply the following number 13×12 . Also draw the multiplier circuit. (10 Marks)

OR

- 8 a. Explain complete execution step for instruction
ADD (R3), R1 (10 Marks)
b. Describe the hardwired computer with an example. (10 Marks)

Module-5

- 9 a. Explain the parallel processing concept with a block diagram showing multiple functional units. (10 Marks)
b. Explain pipelining technique with an example. (10 Marks)

OR

- 10 a. What is instruction pipeline? Explain four segment instruction pipeline concept. (10 Marks)
b. Explain the concept of vector processing. Write few of its application areas. (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

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21CS42

Fourth Semester B.E. Degree Examination, June/July 2023 Design & 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. Explain the algorithm design and analysis process in detail. (10 Marks)
b. Explain the asymptotic narrations with example. (10 Marks)

OR

- 2 a. Explain the general plan of mathematical analysis of recursive algorithm with example. (10 Marks)
b. Design an algorithm to search an element in an array using sequential search. Discuss the Best-case, worst-case and average-case efficiency of this algorithm. (10 Marks)

Module-2

- 3 a. Explain the concept of Divide and Conquer. Write the recursive algorithm to perform Binary search on the list of elements. (10 Marks)
b. Apply Quick sort algorithm to sort the list of characters : P, R, O, G, R, A, M, M, I, N, G. Draw the tree of recursive calls made while tracing. (10 Marks)

OR

- 4 a. Develop a recursive algorithm to find the minimum and maximum element from the list. Illustrate with an example. (10 Marks)
b. Define Topological sorting. Illustrate the topological sorting for the following graph:

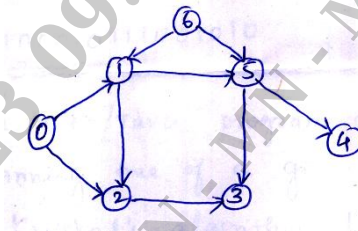


Fig. Q4 (b)

(10 Marks)

Module-3

- 5 a. Solve the following instance of greedy knapsack problem where $n = 4$, $m = 10$, $p = \{40, 42, 25, 12\}$ and $w = \{4, 7, 5, 3\}$. (10 Marks)
b. Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering 'S' as the source vertex. (10 Marks)

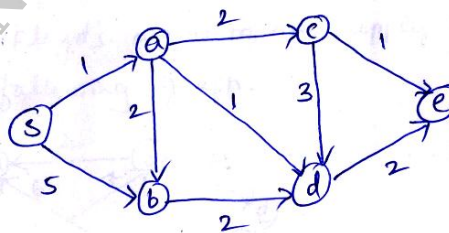


Fig. Q5 (b)

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

OR

- 6 a. Construct a Huffman Tree and resulting code word for the following :

| | | | | | |
|-------------|-----|-----|-----|------|------|
| Character | A | B | C | D | - |
| Probability | 0.4 | 0.1 | 0.2 | 0.15 | 0.15 |

Encode the text ABACABAD and Decode the text 100010111001010.

(10 Marks)

- b. Write a C++/Java program to find minimum cost spanning tree of a given connected graph using Kruskal's algorithm. Use Union-Find algorithm in your program. (10 Marks)

Module-4

- 7 a. Find a minimum-cost path from S to T in the given multistage graph.

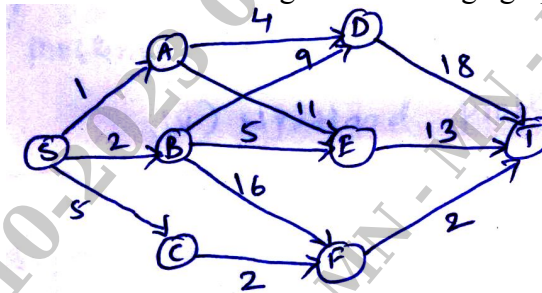


Fig. Q7 (a)

(10 Marks)

- b. Write Floyd's algorithm and apply the same to trace the following graph.

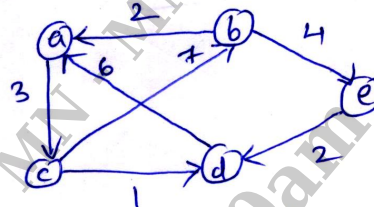


Fig. Q7 (b)

(10 Marks)

OR

- 8 a. Write Horspool's algorithm for string matching. Find the pattern BARBER. In the text : JIM_SAW_ME_IN_A_BARBERSHOP. (10 Marks)

- b. Write a C++/Java program to solve 0/1 knapsack problem using Dynamic programming method. (10 Marks)

Module-5

- 9 a. Differentiate between Back tracking and Branch and Bound technique. Apply back tracking to solve the following instance of the subset-sum problem : $S = \{1, 2, 3, 6, 8\}$, $d = 9$. (10 Marks)

- b. Solve the following assignment problem using branch and bound method. (10 Marks)

| | Job 1 | Job 2 | Job 3 | Job 4 |
|----------|-------|-------|-------|-------|
| Person a | 9 | 2 | 7 | 8 |
| Person b | 6 | 4 | 3 | 7 |
| Person c | 5 | 8 | 1 | 8 |
| Person d | 7 | 6 | 9 | 4 |

OR

- 10 a. Explain the following with examples :

(i) P problems (ii) NP problems

(iii) NP-complete problems (iv) NP-Hard problems

(10 Marks)

- b. Design and implement C++/Java program to find all Hamiltonian cycles in a connected undirected graph G of n vertices using back tracking principle. (10 Marks)

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21CS43

Fourth Semester B.E. Degree Examination, June/July 2023 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. Mention the differences between:
(i) Microprocessor and Microcontrollers (ii) CISC and RISC (10 Marks)
b. With a neat diagram, explain embedded system hardware. (10 Marks)

OR

- 2 a. Explain in detail about Current Program Status Register (CPSR). (10 Marks)
b. With a neat diagram, explain embedded system software. (10 Marks)

Module-2

- 3 a. Explain different branch instruction in ARM processor. (10 Marks)
b. Discuss different types of addressing modes for load store multiple instructions with example. (10 Marks)

OR

- 4 a. Explain single register load store addressing mode syntax, table, index mode with an example. (10 Marks)
b. Discuss SWAP instruction with an example. (10 Marks)

Module-3

- 5 a. Write a C program that prints the square of the integers between 0 to 9 using functions and explain how to convert this C function to an assembly function with command. (10 Marks)
b. Discuss how instruction is scheduled in ARM. (10 Marks)

OR

- 6 a. Explain code optimization, profiling and cycle counting. (10 Marks)
b. Discuss how Registers are allocated to optimize the program. (10 Marks)

Module-4

- 7 a. Explain the purpose of embedded systems used in various domains. (10 Marks)
b. Write a note on core of the embedded systems. (10 Marks)

OR

- 8 a. Explain different classification of embedded system. Give an example for each. (10 Marks)
b. Write a note on sensors and actuators used in various embedded systems. (10 Marks)

Module-5

- 9 a. Explain multi threading. (06 Marks)
b. Explain the concept of deadlock with a neat diagram. (04 Marks)
c. Write a note on message passing. (10 Marks)

OR

- 10 a. Write a note on multiprocessing and multi-tasking. (10 Marks)
b. Explain the role of Integrated Development Environment (IDE) for Embedded Software Development. (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

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

21CS44

Fourth Semester B.E. Degree Examination, June/July 2023 Operating System

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 :
i) Operating System ii) Dual Mode Operation in O.S. **(08 Marks)**
- b. Explain the Operating System services with respect to programs and the users. **(06 Marks)**
- c. What is a Process? Explain different states of a process with state diagram. **(06 Marks)**

OR

- 2 a. With neat diagram, explain the concept of Non virtual machine, Virtual machine and VMware architecture. **(10 Marks)**
- b. Define : i) Context switching ii) Direct and Indirect communication
 iii) Automatic and Explicit buffering. **(10 Marks)**

Module-2

- 3 a. What is Multithreaded process? Explain four benefits of Multithreaded programming. **(06 Marks)**
- b. Consider the set of process with Arrival time, CPU burst time (in milliseconds) and priority shown below (Lower number represents higher priority).

| Process | Arrival Time | Burst Time | Priority |
|---------|--------------|------------|----------|
| P1 | 0 | 10 | 3 |
| P2 | 1 | 1 | 1 |
| P3 | 2 | 2 | 4 |
| P4 | 3 | 1 | 5 |
| P5 | 4 | 5 | 2 |

Write the Gantt chart and solve the Average waiting time and Average turnaround time for
i) SJF Scheduling (Preemptive) ii) Priority Scheduling (Preemptive).

(NOTE : Consider Arrival Time for both Algorithms). **(14 Marks)**

OR

- 4 a. Explain with diagram : i) Multithreading models ii) Multilevel queue scheduling. **(08 Marks)**
- b. What is Critical – Section? How do you implement a monitor solution to the dining – philosophers problem? **(12 Marks)**

Module-3

- 5 a. What is a Deadlock? What are the four necessary conditions for the deadlock to occur? **(04 Marks)**
- b. What are the two methods to eliminate deadlock? **(02 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.

- c. Consider the following snapshot of a system :

| Process | Allocation | | | | Max | | | | Available | | | |
|---------|------------|---|---|---|-----|---|---|---|-----------|---|---|---|
| | A | B | C | D | A | B | C | D | A | B | C | D |
| P1 | 2 | 0 | 0 | 1 | 4 | 2 | 1 | 2 | 3 | 3 | 2 | 1 |
| P2 | 3 | 1 | 2 | 1 | 5 | 2 | 5 | 2 | | | | |
| P3 | 2 | 1 | 0 | 3 | 2 | 3 | 1 | 6 | | | | |
| P4 | 1 | 3 | 1 | 2 | 1 | 4 | 2 | 4 | | | | |
| P5 | 1 | 4 | 3 | 2 | 3 | 6 | 6 | 5 | | | | |

Answer the following using Banker's algorithm.

- Is the system in safe state? If so, what is the safe sequence?
- If request from process P2 (0, 1, 1, 1) is considered immediately, what is the System state and Sequence? **(14 Marks)**

OR

- Which are the commonly used strategies to select a free hole from the available holes? **(06 Marks)**
 - With suitable diagram, explain external fragmentation. **(04 Marks)**
 - With neat diagram, explain paging hardware with TLB. **(10 Marks)**

Module-4

- What is Demand Paging? Explain the steps in handling page fault using appropriate diagram. **(10 Marks)**
 - Consider the page reference string : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 for a memory with 3 frames. Determine the number of page faults using Optimal and LRU replacement algorithms. Which algorithm is most efficient? **(10 Marks)**

OR

- With neat diagram, explain Two – level and Three – level directory structure. **(08 Marks)**
 - Explain Contiguous and Linked disk space allocation methods with diagram. **(12 Marks)**

Module-5

- A drive has 200 cylinders 0 to 199. Head starts at 53 to serve the request queue : 98, 183, 37, 122, 14, 124, 65, 67. Draw disk head schedule diagram and explain for FCFS , SSTF, C – SCAN and C – LOCK. **(12 Marks)**
 - How the Access matrix model of protection can be viewed in OS? **(08 Marks)**

OR

- With neat diagram, explain SAN and MULTICS. **(08 Marks)**
 - Explain the components of a Linux System. **(06 Marks)**
 - Explain in brief fork () and exec () system calls in Linux / UNIX OS, also write a program to implement these system calls in C language. **(06 Marks)**

* * * * *