

Seat No.	
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S.Y. B.Tech. (Computer Science and Engineering) (Part-II)
(Semester - III) (CBCS) Examination, January - 2023

DATA STRUCTURE

Sub. Code : 73278

Day and Date : Wednesday, 25 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary.
 - 3) Figures to the right indicate full marks.

Q1) Solve MCQs. (1 marks each)

[14×1=14]

- a) Which of the following is a linear data structure?
- i) Array
 - ii) AVL Trees
 - iii) Binary Trees
 - iv) Graphs
- b) Consider the following stack implemented using stack.

define SIZE 11

struct STACK

```
{
  int arr[SIZE];
  int top=-1;
}
```

What would be the maximum value of the top that does not cause the overflow of the stack?

- i) 8
 - ii) 9
 - iii) 11
 - iv) 10
- c) The time complexity of quicksort is _____
- i) $O(n)$
 - ii) $O(\log n)$
 - iii) $O(n^2)$
 - iv) $O(n \log n)$
- d) _____ sorting is good to use when alphabetizing a large list of names.
- i) Merge
 - ii) Heap
 - iii) Radix
 - iv) Bubble

P.T.O.

- e) Identify the data structure which allows deletions at both ends of the list but insertion at only one end.
- Input restricted dequeue
 - Output restricted queue
 - Priority queues
 - All of the above
- f) Which of the following statement is false?
- Arrays are dense lists and static data structure.
 - Data elements in linked list need not be stored in adjacent space in memory.
 - Pointers store the next data element of a list.
 - Linked lists are collection of the nodes that contain information part and next pointer.
- g) What data structure would you mostly likely see in a non-recursive implementation of a recursive algorithm?
- Stack
 - Linked list
 - Queue
 - Trees
- h) An adjacency matrix representation of a graph cannot contain information of
- nodes
 - edges
 - direction of edges
 - parallel edges
- i) Which of the following data structures is indexed structure?
- Array
 - Structure
 - Stack
 - Queue
- j) A B-tree of minimum degree t can maximum _____ pointers in a node
- $t-1$
 - $2t-1$
 - $2t$
 - t
- k) An adjacency matrix representation of a graph cannot contain information of
- nodes
 - edges
 - direction of edges
 - parallel edges
- l) The postfix form of the expression $(A+B)*(C*D-E)*F/G$ is? _____
- $AB+CD*E-FG/**$
 - $AB+CD*E-F**G/$
 - $AB+CD*E-*F*G/$
 - $AB+CDE*-*F*G/$

- m) Which data structure is used in breadth first search of a graph to hold nodes?
- | | |
|-----------|-----------|
| i) Stack | ii) Queue |
| iii) Tree | iv) Array |
- n) Which of the following is not an in-place sorting algorithm?
- | | |
|-------------------|----------------|
| i) Selection sort | ii) Heap sort |
| iii) Quick sort | iv) Merge sort |

Q2) Solve any 2 of the following (7 Marks Each) [14]

- a) Give the Definition of Data structure? Explain with suitable examples following terms
- Array
 - Functions
 - Control Structures
- b) Explain working of the Bubble Sort Algorithm. Comment on Complexity of Sorting Algorithm.
- c) Sort the following given numbers using Radix Sort Technique.
6,5,3,1,8,7,2,4

Q3) Solve any 2 of the following. (7 Marks Each) [14]

- Define Stack. Explain stack operations with example
- Explain Binary search with example
- Explain circular queue with example

Q4) Solve any 2 of the following. (7 Marks Each) [14]

- Write algorithm for finding minimum and maximum values from Binary Search Tree.
- What is complete binary tree? Calculate size of an array to store complete Binary tree of depth 4?
- What is B-tree? Explain with suitable example, insertion of a node in B-Tree?

Q5) Solve any 2 of the following (7 Marks Each) [14]

- Describe data structures used for storing a graph.
- Explain graph traversal techniques with Example-BFS
- What is AVL tree? Explain insert node operation of AVL tree.



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S.Y. B.Tech. (Electronics & Telecommunication Engineering)
(Semester - III) (CBCS) Examination, January - 2023
ENGINEERING MATHEMATICS - III
Sub. Code : 73245

Day and Date : Friday, 20 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Use of non-programmable calculator is allowed.
 - 3) Figures to the right indicate full marks.

Q1) Choose the correct alternative from the following. (2Marks each) [14]

- a) The complementary function of $(D^3 - 3D^2 + 4)y = e^{3x}$ is _____
- i) $y = c_1 e^{-x} - (c_2 + c_3 x)e^{2x}$
 - ii) $y = c_1 e^{-x} + (c_2 - c_3 x)e^{2x}$
 - iii) $y = c_1 e^{-x} + (c_2 + c_3 x)e^{-2x}$
 - iv) $y = c_1 e^{-x} + (c_2 + c_3 x)e^{2x}$
- b) If $\vec{a} = a_1 \vec{i} + a_2 \vec{j} + a_3 \vec{k}$ then $\text{div } \vec{a}$ is _____
- i) $2\vec{a}$
 - ii) 0
 - iii) a^2
 - iv) \vec{a}
- c) The curl of vector field $f(x, y, z) = x^2 \vec{i} + 2z \vec{j} - y \vec{k}$ is _____
- i) $-3\vec{j}$
 - ii) $-3\vec{k}$
 - iii) $-3\vec{i}$
 - iv) 0
- d) Value of b_n in a fourier series for the function $f(x) = x$ in the interval $(0, 2\pi)$ is _____
- i) 2π
 - ii) $-2/n$
 - iii) $4\pi^2$
 - iv) None of these
- e) The Laplace transform of $e^{-2t} \cos 4t$ is _____
- i) $\frac{s-2}{(s-2)^2 + 16}$
 - ii) $\frac{s+2}{(s-2)^2 + 16}$
 - iii) $\frac{s-2}{(s+2)^2 + 16}$
 - iv) $\frac{s+2}{(s+2)^2 + 16}$
- f) Inverse Laplace transform of $\frac{1}{(s-1)^2 - 1}$ is _____
- i) $e^t \sinh t$
 - ii) $e^{-t} \sinh t$
 - iii) $e^t \cosh t$
 - iv) $e^{-t} \cosh t$

P.T.O.

g) Let $X = \{a, b, c, d, e, f, g, h, i, j\}$ and

$$A = \frac{0}{a} + \frac{0.2}{b} + \frac{0.5}{c} + \frac{0.2}{d} + \frac{0}{e} + \frac{1}{f} + \frac{0}{g} + \frac{0.5}{h} + \frac{1}{i} + \frac{0.1}{j} \text{ then } |A| \text{ is } \underline{\hspace{2cm}}$$

- i) 3.5 ii) 3.8
iii) 3.3 iv) 3.6

Q2) Attempt any two.

- a) Solve $(D^3 - 3D^2 + 4D - 2)y = e^x + \cos 2x$. [7]
b) Find the constants a and b so that the surface $ax^2 - byz = (a+2)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at $(1, -1, 2)$. [7]
c) Find α cuts and strong α cuts of $A(x) = \frac{x}{x+1}$ and $B(x) = 1 - \frac{x}{10}$, $X = \{0, 1, 2, 3, 4, 5\}$ for $\alpha = 0.6, 0.7$. [7]

Q3) Attempt any two.

- a) Solve $(D^2 + D - 2)y = 1 + x$. [7]
b) Show that the vector field $\vec{F} = (y^2 \cos x + z^3)i + (2y \sin x - 4)j + (3xz^2 + 2)k$ is irrotational and find its scalar potential. [7]
c) If the fuzzy sets A and B are defined by $A = \left\{ \frac{0.4}{x_1} + \frac{0.2}{x_2} + \frac{0.5}{x_3} + \frac{0.8}{x_4} + \frac{1}{x_5} \right\}$ and $B = \left\{ \frac{0.2}{x_1} + \frac{0.3}{x_2} + \frac{0.6}{x_3} + \frac{0.1}{x_4} + \frac{0.1}{x_5} \right\}$ [7]

Determine

- i) \bar{A}
ii) \bar{B}
iii) $A \cup B$
iv) $\bar{A} \cap \bar{B}$
v) $\overline{A \cap B}$
vi) $\overline{A \cup B} \cap \bar{A}$

Q4) Attempt any two.

- a) Obtain the fourier series expansion of $f(x) = x^2$ in the interval $(-1, 1)$. [7]
b) Find the laplace transform of $\int_0^t \frac{e^{-u} \sin u}{u} du$. [7]
c) Six fair coins are tossed simultaneously. If 192 such tosses are made find the expected number of tosses showing [7]
i) one & only one head
ii) no heads
iii) all heads

Q5) Attempt any two.

- a) Obtain half range cosine series for $f(x) = x - x^2$ for $0 \leq x \leq 1$. [7]
b) Find the inverse laplace transform by using Convolution theorem $\frac{1}{(s-2)(s+2)^2}$. [7]
c) The life time of certain type of battery has mean life of 400 hours and a standard deviation of 50 hours. Assuming the distribution of life time to be normal, find [7]
i) The percentage of batteries which have life time of more than 350 hours.
ii) The percentage of batteries which have life time between 300 & 500 hours.

[Given : For S.N.V.z area between $z = 0$ & $z = 1$ is 0.3413 and $z = 0$ & $z = 2$ is 0.4772]



Q5) Solve the following (15 marks)

- a) Draw and explain high frequency model for transistor. Derive expression for f_B consider short circuit load. [7]
- b) Design single stage R-C coupled C_E amplifier $V_{CC} = 12V$, $h_{fe} = 150$, $AV = 60$, $h_{ie} = 2.2K\Omega$, frequency range 20Hz to 20 kHz, $S = 10$ [8]

OR

Find A_v , A_i , R_i , R_o , A_{vg} , A_{ig} for following parameter. $R_g = 500\Omega$, $R_L = 2K\Omega$, $h_{ie} = 1000\Omega$, $h_{re} = 3 \times 10^{-4}$, $h_{oe} = 3 \times 10^{-6} \text{ S}$, $h_{fe} = 250$. [8]

Total No. of Pages : 4

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**S.Y.B.Tech.(ETC)(Part-II) (Semester- III) Examination,
January - 2023**

PCC- ETC-301: ELECTRONIC CIRCUIT DESIGN- I
(CBCS)

Sub. Code : 73247

Day and Date : Wednesday, 25 - 01 - 2023

Time : 10.30 a.m. to 1.00 p.m.

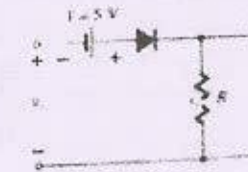
Total Marks :70

Instructions :

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Use of standard datasheet is allowed.

Q1) Choose one correct answer and rewrite the complete statement. [10]

- a) For the given circuit for a $20\text{ V}_{\text{peak}}$ sinusoidal input v_i , what is the value of v_i at which the clipping begins?



- i) 5 ii) 0
- iii) -5 iv) None of the above
- b) Find the cut off frequency for an RC low pass filter of $R = 200\Omega$ and $C = 0.01\mu F$?
- i) 500KHz ii) 100Hz
- iii) 200KHz iv) 79.57KHz

P.T.O.

- c) A sinusoidal voltage with a peak-to-peak value of 30 V is applied to an RC low-pass filter. If the reactance at the input frequency is zero, the output voltage is _____
- i) Zero ii) 12.74 V(p-p)
iii) 18 V(p-p) iv) 1 V(p-p)
- d) PIV of BWR is _____
- i) V_m ii) $2V_m$
iii) 0.7 iv) None of the above
- e) In simple transistor shunt regulator if Zener voltage is 7V, $V_{BE} = 0.7V$ then output voltage (V_o) is Volt
- i) 7.7 ii) 8
iii) 8.3 iv) 0
- f) Which of the following is the best biasing method for transistor bias?
- i) Emitter bias ii) Voltage divider bias
iii) Fixed bias iv) Collector feedback bias
- g) There are _____ h parameters of a transistor.
- i) Four ii) Two
iii) Three iv) None of the above
- h) For a fixed bias circuit, the drain current was 1 mA, what is the value of source current?
- i) 0 mA ii) 1 mA
iii) 2 mA iv) 3 mA
- i) In CE arrangement, the value of input impedance is approximately equal to _____
- i) h_{ie} ii) h_{oe}
iii) h_{re} iv) None of the above
- j) If the value of collector current I_C increases, then the value of V_{CE} _____
- i) Remains the same ii) Decreases
iii) Increases iv) None of the above

Q2) Solve the following (15 marks)

- a) Design zener regulator with zener voltage $V_z = 12V$ to a load for which $I_L(\max) = 150mA$, V_{in} varies between 20 to 25V. [7]

OR

Draw and explain the operation of Voltage Tripler. [7]

- b) Design FWR power supply using capacitor filter for following specifications $V_o = 15V$, $I_o = 70mA$, $r = 2\%$. [8]

Q3) Solve the following (15 marks)

- a) Explain Half wave rectifier with neat diagram and waveform. [7]

- b) Design emitter follower regulator $V_o = 4.4V$, $I_o = 40mA$ and $v_{in} = 8-15V$, (use SL100) [8]

OR

Derive gain equation for High pass filter also design high pass filter with cut-off frequency 5 KHz and draw the frequency response. [8]

Q4) Solve the following (15 marks)

- a) Derive expression for lower 3dB frequency of CE amplifier by considering coupling capacitor $[C_c]$. Calculate C_c for $R_1 = 12 K'\Omega$, $R_2 = 6.8 K'\Omega$, $h_{ie} = 4.5K'\Omega$, $h_{fe} = 320$, $R_s = 400'\Omega$. [8]

- b) Draw and explain hybrid equivalent circuit for CC configuration of transistor. [7]

OR

Derive the expression for lower cut off frequency of R-C coupled amplifier considering square wave. [7]

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S.Y.B.Tech. (CBCS) (Computer Science and Engineering)
(Part - II) (AIML) (Semester - III) Examination, January - 2023

PROBABILITY AND STATISTICS

Sub. Code : 86160

Day and Date : Friday, 20 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 01.00 p.m.

- Instructions:**
- 1) Solve any three questions from Q.1 to Q.4.
 - 2) Solve any three questions from Q.5 to Q.8.
 - 3) Figures to the right indicate full marks.
 - 4) Use of non-programable calculator is allowed.

Q1) a) Find the median of the following data: [6]

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	4	16	15	20	7	5

b) Calculate standard deviation for the following data. [6]

Class	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	3	61	132	153	140	51	2

Q2) a) Calculate the coefficient of correlation between x and y for the following data. [5]

x	25	30	32	35	37	40	42	45
y	8	10	15	17	20	23	24	25

b) Fit a straight line $y = a + bx$ to the following data. [6]

x	0	5	10	15	20	25
y	12	15	17	22	24	30

Q3) a) Find the probability that at most 4 defective bulbs will be found in a box of 200 bulbs if it is known that 2 percent of the bulbs are defective. [5]

b) The marks obtained by 1000 students in an examination are found to be normally distributed with mean 70 and standard deviation 5. Find the number of students

whose marks will be (i) between 60 and 75, (ii) more than 75.

[Given: For S.N.V. $z =$ area from $z = 0$ to $z = 1$ is 0.3413 and from $z = 0$ to $z = 2$ is 0.4772]

[6]
P.T.O.

- Q4) a) Find the equation of line of regression y on x for the following data. [6]

x	5	7	8	10	11	13	16
y	33	30	28	20	18	16	9

- b) The probability that a student in an evening college will graduate is 0.4. Determine the probability that out of 5 students (i) none (ii) one (iii) at least one will graduate. [6]

- Q5) a) A die was thrown 9000 times and of these 3220 yielded a 3 or 4. Can the die be regarded as unbiased? [6]

- b) Before an increase in excise duty on tea, 400 people out of a sample of 500 persons were found to be tea drinkers. After an increase in duty, 400 people were tea drinkers in a sample of 600 people. Using standard error of proportion, state whether there is a significant decrease in the consumption of tea. [6]

- Q6) a) If the fuzzy sets A and B are defined by. [6]

$$A(x) = \frac{0.2}{x_1} + \frac{0.5}{x_2} + \frac{0.9}{x_3} + \frac{0.6}{x_4} + \frac{0.7}{x_5} + \frac{0.2}{x_6}$$

$$B(x) = \frac{0.7}{x_1} + \frac{0.9}{x_2} + \frac{0.5}{x_3} + \frac{0.2}{x_4} + \frac{0.1}{x_5} + \frac{0.3}{x_6}$$

Find $\bar{A} \cap B, A \cup \bar{B}, A \cup \bar{A}, B \cup \bar{B}$.

- b) For the following fuzzy sets A and B, find the fuzzy cardinality of $A \cup B$. [5]

$$A = \left\{ \frac{0.1}{x_1} + \frac{0.25}{x_2} + \frac{0.2}{x_3} + \frac{0.9}{x_4} + \frac{0.35}{x_5} \right\}, B = \left\{ \frac{0.7}{x_1} + \frac{0.5}{x_2} + \frac{0.1}{x_3} + \frac{0.95}{x_4} + \frac{0.30}{x_5} \right\}$$

- Q7) a) Solve the following assignment problem. [6]

		Jobs			
		A	B	C	D
Machines	I	17	19	16	18
	II	12	17	14	15
	III	19	21	20	18
	IV	15	22	18	16

- b) Explain the Hungarian method of solving an assignment problem. [5]

- Q8) a) In order to test whether a coin is perfect, it is tossed 6 times. The null hypothesis of perfectness is rejected if and only if more than 5 heads are obtained. Obtain the (i) critical region (ii) probability of type I error (iii) probability of type II error, when the corresponding probability of getting a head is 0.2. [6]

- b) Define α -cuts and strong α -cuts and find α -cuts and strong α -cuts for $\alpha = 0.4, 0.8$ of the following Fuzzy set. [6]

$$A(x) = \frac{0.8}{p} + \frac{0.6}{q} + \frac{0.5}{r} + \frac{0.4}{s} + \frac{1}{t}$$



Q8) Attempt any two.

- a) If the fuzzy set A and B are defined by the following membership functions:

$$A(x) = \frac{0.1}{1} + \frac{0.6}{2} + \frac{0.8}{3} + \frac{0.9}{4} + \frac{0.7}{5}, \quad B(x) = \frac{0.9}{1} + \frac{0.7}{2} + \frac{0.5}{3} + \frac{0.2}{4} + \frac{0.1}{5}$$

Calculate $\bar{A}, \bar{B}, \overline{A \cup B}, \overline{A \cap B}$.

[6]

- b) Calculate the fuzzy number
- $A + B, A - B$

[6]

$$\text{where } A(x) = \begin{cases} \frac{x+1}{2} & -1 \leq x \leq 1 \\ \frac{3-x}{2} & 1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

$$B(X) = \begin{cases} \frac{x-1}{2} & 1 \leq x \leq 3 \\ \frac{5-x}{2} & 3 \leq x \leq 5 \\ 0 & \text{otherwise} \end{cases}$$

- c) Solve the following assignment problem

[6]

		To			
		I	II	III	IV
From	A	8	26	17	11
	B	13	28	4	26
	C	18	29	18	15
	D	19	23	24	10

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S.Y. B.Tech (Computer Science and Engg.)
(Semester - III) (CBCS) Examination, January - 2023
APPLIED MATHEMATICS
Sub. Code : 73276

Day and Date : Friday, 20 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions : 1) Attempt any three questions from each section.
 2) Figures to the right indicate full marks.
 3) Use of non programmable calculator is allowed.

SECTION - I

- Q1) a) Find coefficient of correlation from following data. [6]

x:	1	2	3	4	5	6	7	8	9
y:	9	8	10	12	11	13	14	16	15

- b) Fit a straight line
- $y = a + bx$
- to following data. [6]

x:	1	2	3	4	6	8
y:	2.4	3	3.4	4	5	6

- Q2) a) From a box containing 100 transistors 20 of which are defective, 10 are selected at random. Find the probability that [6]

- i) All will be defective.
 ii) All will be non defective.
 iii) At least one is defective.

- b) If the probability that an individual suffer a bad reaction from certain injection is 0.001. Determine the probability that out of 2000 individual [5]

- i) Exactly 3,
 ii) More than 2 will suffer a bad reaction.

Q3) a) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using Trapezoidal Rule. [5]

b) Evaluate $\int_0^1 \sqrt{1+x+x^2} dx$ using Simpson's $\left(\frac{1}{3}\right)^{rd}$ Rule. [6]

Q4) Attempt any two.

a) Fit a second degree parabola to the following data. [6]

x:	1	2	3	4	5	6	7	8	9
y:	2	6	7	8	10	11	11	10	9

b) In a sample of 1000 student the mean and standard deviation of marks obtained by the student in a certain test are 14 and 2.5. Assuming the distribution to be normal find the number of students getting marks. [6]

- Between 12 and 15,
- Above 18,
- Below 8.

(Given: For a S.N.V.z area between $z = 0$ and $z = 0.4$ is 0.1554, that between $z = 0$ and $z = 0.8$ is 0.2881, that between $z = 0$ and $z = 1.6$ is 0.4452 that between $z = 0$ and $z = 2.4$ is 0.4918)

c) Evaluate $\int_{0.2}^{1.4} (\sin x - \log x + e^x) dx$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ Rule. [6]

SECTION - II

Q5) a) Define: [6]

- Fuzzy intersection
- Height of fuzzy set
- Degree of subset hood $S(C, D)$ for the fuzzy sets C and D.

b) Find α -cut and strong α -cut for $\alpha = 0.2, 0.4, 0.6, 0.8$ for the fuzzy set defined by $B(x) = \frac{0.2}{1} + \frac{0}{2} + \frac{0.65}{3} + \frac{0.7}{4} + \frac{0.35}{5}$. [6]

Q6) a) Define fuzzy number and determine whether the following fuzzy set is a fuzzy number

$$A(x) = \begin{cases} \sin x & 0 \leq x \leq \pi \\ 0 & \text{otherwise} \end{cases} \quad [5]$$

b) Calculate the fuzzy number $A + B, A.B$ [6]

$$\text{where } A(x) = \begin{cases} \frac{3+x}{3} & -3 \leq x \leq 0 \\ \frac{3-x}{3} & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

$$B(x) = \begin{cases} \frac{x-3}{3} & -3 \leq x \leq 6 \\ \frac{9-x}{3} & 6 \leq x \leq 9 \\ 0 & \text{otherwise} \end{cases}$$

Q7) Following table represent expected time required (in min.) to five different groups for completing four different tasks. Determine assignment schedule in order to minimize the time of completion of tasks. [11]

	Group					
Tasks		A	B	C	D	E
	I	35	24	28	26	31
	II	34	32	35	24	32
	III	29	25	38	35	33
	IV	28	26	27	33	32

Q5) Solve any 2 of the following. (7 Mark Each).

- a) Given $S = \{a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8\}$ what subsets are represented by B_{17} and B_{31} ? Also write how will you designate the subsets $\{a_2, a_6, a_7\}$ and $\{a_1, a_8\}$. [7]
- b) Describe the terms. [7]
- Proper inclusion
 - Relative complement
 - Absolute complement
 - Symmetric difference
- $A = \{1, 2, 3, 4, 5\}$ $B = \{a, b, 5, 6\}$
Is A proper subset of B?
Find $A-B$ and $B-A$
Find $A+B$
- c) For the function $f(x, y, z) = x + \bar{y} + z$ give. [7]
- Truth table representation.
 - K-map representation
 - Cube representation
 - n-space representation

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Seat No.

S.Y. B.Tech. (Computer Science and Engineering) (Part - II)
(Semester - III) (CBCS) Examination, January - 2023
DISCRETE MATHEMATICAL STRUCTURES

Sub. Code: 73277

Day and Date : Monday, 23 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions : 1) All questions are compulsory.
2) Assume suitable data wherever necessary.

Q1) Solve MCQs. (2 Marks Each).

- a) Infix to Prefix of the given expression $P \rightarrow Q \wedge R \vee S$ is _____.
- $\rightarrow P \vee \wedge Q R S$
 - $\rightarrow P \vee Q R \wedge S$
 - $\rightarrow P \vee Q \wedge R S$
 - $\rightarrow P \vee Q \wedge R S$
- b) $P \rightarrow (Q \rightarrow R)$ is equivalent to.
- $(P \wedge Q) \rightarrow R$
 - $(P \wedge Q) \rightarrow Q$
 - R
 - Tautology
- c) Let $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and relation x divides y be a partial ordering on D_{30} . The LUB of 10 and 15 is.
- 10
 - 15
 - 30
 - 6
- d) Let A and B be two sets such that $A = \{1, 3, 5, 7, 11\}$, $B = \{2, 6, 8, 5, 11\}$ then the set $A-B$ is equal to.
- $\{1, 2, 3, 5, 6, 7, 8, 11\}$
 - $\{1, 3, 5, 7, 11\}$
 - $\{2, 6, 8\}$
 - $\{1, 3, 7\}$
- e) Partial ordered relation is transitive, reflexive and _____.
- Antisymmetric
 - Bisymmetric
 - Anti reflexive
 - Asymmetric

f) Let $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ Let R be a relation defined on X given as $R = \{ \langle x, y \rangle \mid x + y = 10 \}$. Then R is.

- i) Reflexive, Symmetric and Transitive
- ii) Irreflexive Antisymmetric and Transitive
- iii) Only Symmetric
- iv) Only Antisymmetric

g) Let n be a positive integer and D_n be set of all positive divisors of n . Then D_n is a lattice under the relation of divisibility. Then what are the elements of D_{20} ?

- i) $D_{20} = \{1, 2, 4, 5, 10, 20\}$ ii) $D_{20} = \{1, 2, 4, 10, 20\}$
- iii) $D_{20} = \{1, 2, 4, 10, 20\}$ iv) $D_{20} = \{1, 2, 4, 5, 6, 10, 20\}$

Q2) Solve any 2 of the following. (7 Marks Each).

a) Show the following without constructing truth table:

[7]

- i) $((P \vee \neg P) \rightarrow Q) \rightarrow ((P \vee \neg P) \rightarrow R) \Rightarrow (Q \rightarrow R)$
- ii) $\neg(P \leftrightarrow Q) \Leftrightarrow (P \vee Q) \wedge \neg(P \wedge Q)$

b) Consider the set $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{ \langle x, y \rangle \mid x - y \text{ is divisible by } 5 \}$.

[7]

- i) Write the relation set R
- ii) Identify which properties are satisfied by R
- iii) Is R an Equivalence relation
- iv) Write the matrix of R and sketch its graph

c) Define Lattice and Totally ordered set. Give one example of totally ordered set. Let $S = \{a, b, c\}$. Draw the diagram of $\langle \rho(S), \subseteq \rangle$. Is it a lattice? [7]

[7]

Q3) Solve any 2 of the following. (7 Marks Each).

a) Define and give one example of each.

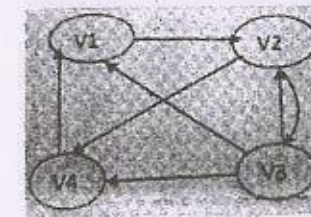
- i) Graph
- ii) Geodesic path
- iii) Mixed graph
- iv) Weighted graph
- v) Unilaterally connected graph
- vi) Null graph
- vii) Complement of a Graph

b) Define Monoid Homomorphism. Give an example. [7]

c) Define Semigroup, Monoid and path Group. Give an example of each. [7]

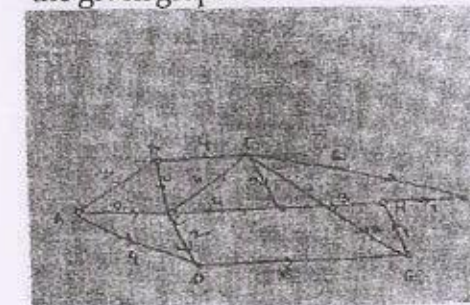
Q4) Solve any 2 of the following. (7 Marks Each).

a) Define adjacency matrix and path matrix, Find adjacency matrix and path matrix for the given graph. [7]



Write one Simple path and one Elementary path from v_1 to v_3 .

b) Write a note on PERT. Compute the earliest completion time & latest completion time for the given graph. Identify and write the critical path in the given graph? [7]



c) Define the following terms and give one example of each. [7]

- i) Bounded lattice
- ii) Complete lattice
- iii) Complemented lattice
- iv) Distributive lattice