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Std: XII VOC – CT First Term Exam, October, 2024  
Date: 23/10/24 Subject : Mathematics (voc)

Duraton: 2 hr.  
Marks:40

Instructions :

- All questions are compulsory
- There are four sections in this question paper(A,B,C&D)
- In section A there are 4 questions of 1 mark each.
- Section B contains 7 questions of 2 marks each.
- Section C contains 2 questions of 3 marks each.
- Section D contains 4 question of 4 marks each.
- Write the number of each question clearly on the answer book.

**Section A**

Question numbers from 1 to 4 carry 1 mark each.

1. Find the value of  $x$  if

$$\begin{bmatrix} -3 & 2 \end{bmatrix} \begin{bmatrix} -1 \\ x \end{bmatrix} = [1]$$

- Construct matrix  $A=[a_{ij}]_{3 \times 1}$  such that  $a_{ij} = 2i + j^2$
- If  $y = \tan^2 4x$ , find  $dy/dx$
- Differentiate  $5^x - \sec x$  with respect to  $x$

**Section B**

Question numbers from 5 to 11 carry 2 marks each.

5. Construct a backward difference table for the following data.

x	3	6	9	12	15
y	10	13	15	11	9

Also find  $\nabla^2 y_6$  ,  $\nabla^4 y_{12}$

- Find  $dy/dx$ , if  $y = e^{\sin x} + x^{x+2}$
- Three coins are tossed, find the probability of getting two heads up.
- Two cards are drawn from a pack of cards, find the probability that both are kings.
- Find  $dy/dx$  if  $x^2 + y = xy$
- If  $A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$ , find  $|AB|$
- Differentiate  $x^2 + 1$  w.r.t.  $x^3$

### Section C

Question numbers 12 and 13 carry 3 marks each.

12. Discuss the continuity of the function at  $x=4$

$$\text{if } f(x) = \frac{x^2 - 3x + 2}{x - 3} \quad 0 \leq x < 4$$

$$= \frac{2x^2 - 8}{x - 2} \quad 4 \leq x < 6$$

13. If a function is continuous on its domain where

$$f(x) = \begin{cases} 5b - 3ax & \text{for } -4 \leq x < -2 \\ 4x + 1 & \text{for } -2 \leq x < 2 \\ ax^2 + 17b & \text{for } 2 \leq x < 4 \end{cases}$$

find the values of  $a$  and  $b$

### Section D

Question numbers from 14 to 17 carry 4 marks each.

14. Find the inverse of the following matrix

$$\begin{bmatrix} 2 & -1 & 0 \\ 1 & 0 & 4 \\ 1 & -1 & 1 \end{bmatrix}$$

15. For the following table

X	2	6	12
Y	3	6	9

Using Lagrange's Interpolation formula, find  $f(10)$

16. Obtain the regression line of  $x$  on  $y$  for the following data

X	1	2	4	5
Y	-3	-1	3	5

Also find value of  $x$  for  $y = 1$

17. Solve the following L.P.P. by graphical method

$$\text{Maximize } z = 5x + 7y$$

$$\text{Subject to } 5x + 4y \leq 20$$

$$x \leq 6$$

$$y \leq 4$$

$$\text{and } x \geq 0, y \geq 0$$