			Marks	BL	PO	CO	PSO
Q.6		Attempt any two:					
	i.	Define determinants. Write the basic properties of determinants with examples.	**5**	01	03	03	
	ii.	Find the area of triangle in determinant form whose vertices are A (0, 0), B (0, -5), and C (8, 0).	**5**	03	03	03	
	iii.	Solve the following linear equations by using Cramer's Rule. $x + y + z = 6$ $x - y + z = 2$ $x + 2y - z = 2$	**5**	03	03	03	

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Total No. of Questions: 6 *Total No. of Printed Pages: 4*

Enrollment No......................................

Faculty of Science/Engineering
End Sem Examination Dec 2024
CA3CO17 Mathematics -I

Programme: BCA/BCA-MCA (Integrated) Branch/Specialisation: Computer Application

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	PO	CO	PSO
Q.1	i.	What will be the intersection of Sets: Set A = {1,2,3,4} and Set B = {3,4,5}? (a) {3,4} (b) {3,4,5} (c) {3,4,2} (d) None of these	**1**	01	01	01	
	ii.	For the set A= {3,4} and B= {1,2}, cartesian product can be define as A x B =_____. (a) {(3,1), (3,2), (4,1), (4,2)} (b) {(1,3), (2,3), (1,4), (4,2)} (c) {3,4,1,2} (d) None of these	**1**	01	01	01	
	iii.	If $f(x)$ = 6x then value of f (0) is- (a) 1 (b) 0 (c) 5 (d) None of these	**1**	01	01	01	
	iv.	What is the highest degree of a quadratic function? (a) 2 (b) 3 (c) 1 (d) None of these	**1**	01	01	01	
	v.	The value of $\lim_{x \to 2} x^2 - 2x + 3$ is____. (a) 2 (b) 3 (c) -3 (d) None of these	**1**	01	01	01	

vi. What is the derivative of a constant C with respect to x? **1** 01 01 01

(a) C (b) 0

(c) 1 (d) None of these

vii. The value of $\int 1\, dx$ is- **1** 01 01 01

(a) x+c (b) 1+c

(c) 0+c (d) None of these

viii. The value of $\int \frac{1}{x} dx$ is- **1** 01 01 01

(a) $-\frac{1}{x^2}$ (b) $\frac{1}{x^2}$

(c) x^x (d) None of these

ix. If A = $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ **1** 01 01 01

Then the value of $|A|$ is-

(a) 0 (b) 3

(c) 1 (d) None of these

x. If A = $\begin{pmatrix} -1 & 2 & 3 \\ 2 & -3 & 1 \\ 3 & -1 & 1 \end{pmatrix}$ **1** 01 01 01

Then the value of minor element (-1) or M_{11} is-

(a) 2 (b) 3

(c) 0 (d) None of these

Q.2 Attempt any two:

i. Define set. Explain five types of sets with one example each. **5** 01 01 01

ii. If U be the universal set and A, B are two finite subsets of U defined as follows. **5** 03 03 03

$U = \{1, 2,3, 4, 5, 6, 7,8,9,10\}$

$A = \{1,4,7,9\}$ and

$B = \{2,5,9,10\}$ then show that

(a) $(A \cup B)' = A' \cap B'$

(b) $(A \cap B)' = A' \cup B'$

iii. There are 500 students in a school, 220 like science subject, 180 like math and 40 like both science and math. Find the number of students who like Science but not math by Venn diagram. **5** 03 03 03

Q.3 Attempt any two:

i. Define Function. Explain five types of function with one example each. **5** 01 03 03

ii. If $f(x) = x^2 - 3x + 5$ then find the value of f(0), f(1), f(2) ,f(-1) and f(2). **5** 03 03 03

iii. Define even function: **5** 01 03 03

If $f(x) = x^2 - 4x + 8$ and $g(x) = x^2 + 4x - 8$ then show that $f(x) + g(x)$ is even function.

Q.4 Attempt any two:

i. Define limit, continuity and differentiation n. **5** 01 03 03

ii. Find the derivative of each of the following with respect to variable x. **5** 03 03 03

(a) $(sinx)\,(x^2 - 3x + 5)$

(b) $e^x logx$

iii. Find the $\frac{dy}{dx}$ **5** 03 03 03

(a) $y = \left(x^2 \frac{tanx}{cosx} \right)$

(b) $y = \log(\log(log(\log(sinx))))$

Q.5 Attempt any two:

i. Define integration and solve- **5** 01 03 03

$$\int e^x.(x^2+1)dx$$

ii. Evaluate- **5** 03 03 03

$$\int logxdx$$

iii. Evaluate- **5** 03 03 03

$$\int_0^1 (2 + sin2x)\, dx.$$

Medicaps University

End Sem Exam Dec-2024

BCA Mathematics-I CA3CO17

Q.I)

(I) (a) {3,4} 1X10=10

(II) (a) {(3,1),(3,2),(4,1),(4,2)}

(III) (b) 0

(IV) (a) 2

(V) (b) 3

(VI) (b) 0

(VII) (a) $x+c$

(VIII) (d) None of these.

(IX) (c) 1

(X) (d) None of these.

Q2)

(I) Set :->

The collection of well defined objects is called set. Every set is dinoted by capital alphbates like A, B, C, --- etc. +1

Types of set

(1) Empty set :-> A set in which no element is present is called empty set. It is dinoted by ϕ

(2) Finite set :->

A set which contained finite number of elements. is called Finite set. +1

ex. - A = {1, 2, 3, 4}

(3) Infinite set :->

A set which contained - Infinite elements is called "Infinite set". +1

ex. - I = {- - - -3, -2, -1, 0, 1, 2, 3, - - -}

(4) Power set :->

The set of all possible sub sets of the given set A is called power set of A. It is dinoted by P(A)

ex. Let

A = {a, b} then +1

P(A) = { {a, b}, {a}, {b} }

(5) Universal set :->

It is the super set of all sets considered under a given study. It is dinoted by "U" +1

U = {All English alphabets}

A = {set of vowels. }

B = {set of consonants}

Q2) (II) $U = \{1,2,3,4,5,6,7,8,9,10\}$

$A = \{1,4,7,9\}$, $B = \{2,5,9,10\}$

$A' = \{2,3,5,6,8,10\}$, $B' = \{1,3,4,6,7,8,10\}$ +1

$A \cup B = \{1,2,4,5,7,9,10\}$

$(A \cup B)' = \{3,6,8\}$ —— (1) +1

$A' \cap B' = \{3,6,8\}$ —— (2)

from eqs (1) & (2)

$(A \cup B)' = A' \cap B'$ +1

$A \cap B = \{9\}$

$(A \cap B)' = \{1,2,3,4,5,6,7,8,10\}$ — (3)

$A' \cup B' = \{1,2,3,4,5,6,7,8,10\}$ — (4) +1

from eqs (3) & (4)

$(A \cap B)' = A' \cup B'$ +1

Q2) (III) Let

$n(U)$ = Number of students in school

$\Rightarrow n(U) = 500$

$n(A)$ = Number of students like science

$\Rightarrow n(A) = 220$

n(B) = number of students like maths

$\Rightarrow n(B) = 180$

$n(A \cap B)$ = number of students like science and maths.

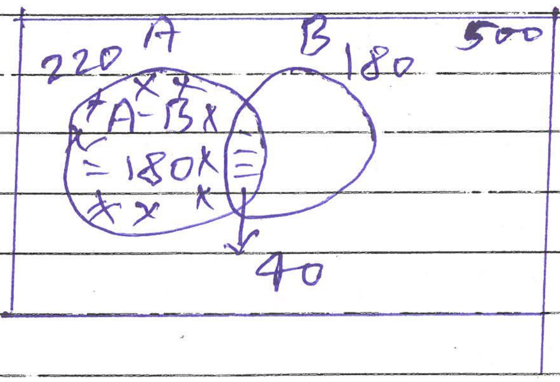
$\Rightarrow n(A \cap B) = 40$

A - B = number of students like science but not maths

$n(A-B) = n(A) - n(A \cap B)$

$n(A-B) = 220 - 40$ +1

$n(A-B) = 180$



+4

Q3)

(I) Function:->

A relation from set A to set B is said to be a function, if every element of set A has one and only one image in set B. +1

Types of function

① Constant function:->

The function $f: R \to R$ defined by

$$y = f(x) = c \quad \forall x \in R$$

ex. $f(x) = 2$ +1

② Modulus function:->

The function $f: R \to R$ defined by

$$f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

is called modulus function. It is denoted by $|x|$ +1

③ Signum function:->

The function $f: R \to R$ defined by

$$f(x) = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{"} \ x = 0 \\ -1 & \text{"} \ x < 0 \end{cases}$$

is called signum function. It is usually denoted by $y = f(x) = \operatorname{sgn}(x)$ +1

(4) Greatest Integer Function :->

The function $f: R \to R$ defined as the greatest integer less than or equal to x. It is usually denoted by $f(x) = [x]$

ex. $f(2) = [2] = 2$ & $f(3.4) = [3.4]$
$= 3$

(5) Identity Function :->

The function $f: R \to R$ defined by

$$y = f(x) = x \quad \forall x \in R$$

is called identity function +1

Q3)

(II) Given

$$f(x) = x^2 - 3x + 5$$

$f(0) = 0^2 - 3 \times 0 + 5 = 5$ +1

$f(1) = 1^2 - 3 \times 1 + 5 = 3$ +1

$f(2) = 2^2 - 3 \times 2 + 5 = 3$ +1

$f(-1) = (-1)^2 - 3 \times (-1) + 5 = 9$ +1

$f(2) = 3$ +1

Q3) (III)

A function $f(x)$ is said to be even function if $f(-x) = f(x)$ +1

Given

$$f(x) = x^2 - 4x + 8$$

$$g(x) = x^2 + 4x - 8$$

$$f(x) + g(x) = x^2 - \cancel{4x} + \cancel{8} + x^2 + \cancel{4x} - \cancel{8}$$ +1

$$f(x) + g(x) = 2x^2 = (f+g)(x)$$ +1

Now $(f+g)(-x) = 2(-x)^2$

$$= 2x^2$$ +1

$$(f+g)(-x) = (f+g)(x)$$

+1

$\therefore$ $f(x) + g(x)$ is an even function +2

Q4) (I) Limit :-> Let $f(x)$ is any given function define on set of real numbers then a number l is said to be limit of $f(x)$ at $x = a$ if

$$\lim_{x \to a} f(x) = l$$ +1

continuity :->

A function $f(x)$ is said to be continuous at point $x = a$ if

$$\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x) = f(a)$$ +2

Differentiation :->

A function is said to be differentiable at point $x=a$ if

$$Lf'(a) = Rf'(a)$$

where

$$Lf'(a) = \lim_{h \to 0} \frac{f(a-h) - f(a)}{-h}$$

$$Rf'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h} \quad +2$$

Q4)
(II) Let

(a) $y = \underset{\text{I}}{(\sin x)}\underset{\text{II}}{(x^2 - 3x + 5)}$

$$\frac{dy}{dx} = \sin x \frac{d}{dx}(x^2 - 3x + 5) + (x^2 - 3x + 5)\frac{d}{dx}(\sin x) \quad +1$$

$$\frac{dy}{dx} = \sin x(2x - 3) + (x^2 - 3x + 5)\cos x \quad +1$$

Ans

(b) $y = \underset{\text{I}}{e^x} \cdot \underset{\text{II}}{\log x}$

$$\frac{dy}{dx} = e^x \frac{d}{dx}(\log x) + \log x \frac{d}{dx}(e^x) \quad +1$$

$$\frac{dy}{dx} = e^x \cdot \frac{1}{x} + \log x \cdot e^x \quad +1$$

$$= e^x\left(\frac{1}{x} + \log x\right) \quad \text{Ans} \quad +1$$

Q4)

(III) (a) $y = x^2 \cdot \frac{\tan x}{\cos x}$

$$\frac{dy}{dx} = \frac{d}{dx}\left[\frac{x^2 \cdot \tan x}{\cos x}\right]$$

$$= \frac{\cos x \cdot \frac{d}{dx}(x^2 \cdot \tan x) - x^2 \tan x \cdot \frac{d}{dx}(\cos x)}{\cos^2 x} \quad +\frac{1}{2}$$

$$= \left[\cos x\left[x^2 \cdot \frac{d}{dx}(\tan x) + \tan x \, \frac{d}{dx}(x^2)\right] - (x^2 \tan x)(-\sin x)\right] \Big/ \cos^2 x \quad +\frac{1}{2}$$

$$= \frac{\cos x\left[x^2 \sec^2 x + \tan x \cdot 2x\right] + x^2 \cdot \tan x \cdot \sin x}{\cos^2 x} \quad +2$$

$$= \frac{x^2 \sec x + 2x \sin x + x^2 \tan x \cdot \sin x}{\cos^2 x} \quad +\frac{1}{2}$$

Ans

or

Student can also solve by

$$\frac{dy}{dx} = x^2 \cdot \frac{d}{dx}\left(\frac{\tan x}{\cos x}\right) + \frac{\tan x}{\cos x}\,\frac{d}{dx}(x^2)$$

$$= x^2\left[\frac{-\tan x \cdot \sin x - \cos x}{\cos^2 x}\right] + \frac{\tan x}{\cos x} \times 2x$$

Q4)
(III)
(b)

$$y = \log(\log(\log(\log(\sin x))))$$

put
$$\sin x = t$$

$$y = \log(\log(\log(\log t)))$$

put $\log t = u$

$$y = \log(\log(\log u))$$

put $\log u = v$

$$y = \log(\log v)$$

put $\log v = z \Rightarrow y = \log z$ +1

$y = \log z \quad z = \log v \quad v = \log u \quad u = \log t$

$$\frac{dy}{dz} = \frac{1}{z}, \quad \frac{dz}{dv} = \frac{1}{v}, \quad \frac{dv}{du} = \frac{1}{u}, \quad \frac{du}{dt} = \frac{1}{t}$$

& $t = \sin x \Rightarrow \frac{dt}{dx} = \cos x$

Now
$$\frac{dy}{dx} = \frac{dy}{dz} \times \frac{dz}{dv} \times \frac{dv}{du} \times \frac{du}{dt} \times \frac{dt}{dx}$$ +1

$$\frac{dy}{dx} = \frac{1}{z} \times \frac{1}{v} \times \frac{1}{u} \times \frac{1}{t} \times \cos x$$

$$\frac{dy}{dx} = \frac{1}{\log x} \times \frac{1}{\log u} \times \frac{1}{\log t} \times \frac{1}{\sin x} \times \cos x$$

$$\frac{dy}{dx} = \frac{1}{\log(\log u)} \times \frac{1}{\log(\log t)} \times \frac{1}{\log(\sin x)} \times \cot x$$

$$\frac{dy}{dx} = \frac{1}{\log(\log(\log t)} \times \frac{1}{\log(\log \sin x)} \times \frac{\cot x}{\log(\sin x)}$$

$$\frac{dy}{dx} = \frac{1}{\log(\log(\log(\sin x)))} \times \frac{1}{\log(\log \sin x)} \times \frac{\cot x}{\log \sin x}$$ +1

Ans

Q5)

(I) ~~Defn~~

Integration is reverse process of differentiation. i.e. if

$$\frac{d}{dx}[f(x)] = \phi(x) \text{ then.}$$

$$\int \phi(x)\,dx = f(x) + c$$ +1

where c is constant of integration.

Let

$$I = \int \underset{II}{e^{x}} \underset{I}{(x^2+1)}\,dx$$

wkt.

$$\int I \cdot II\,dx = I\int II\,dx - \int\left[\frac{d}{dx}(I)\int II\,dx\right]dx \quad +1$$

$$I = e^{x}(x^2+1)\int e^{x}dx - \int\left[\frac{d}{dx}(x^2+1)\int e^{x}dx\right]dx$$

$$I = (x^2+1)\cdot e^{x} - \int\left[2x\cdot e^{x}\right]dx \quad +1$$

$$I = (x^2+1)e^{x} - 2\int \underset{I}{x}\cdot \underset{II}{e^{x}}\,dx$$

$$I = (x^2+1)e^{x} - 2\left\{x\int e^{x}dx - \int\left\{\frac{d}{dx}(x)\int e^{x}dx\right\}dx\right] \quad +1$$

$$I = (x^2+1)e^{x} - 2\left[x\cdot e^{x} - \int(1\cdot e^{x})\,dx\right] \quad \cancel{+1}$$

$$I = (x^2+1)e^{x} - 2xe^{x} + 2e^{x} + c \quad +1$$

$$I = e^{x}(x^2-2x+3) + c \quad \text{Ans}$$

Q5) (II) Let

$$I = \int \log x \, dx$$

$$I = \int \underset{\mathrm{I}}{\log x} \times \underset{\mathrm{II}}{1} \, dx$$ +1

$$I = \log x \int 1 \cdot dx - \int \left[\frac{d}{dx} (\log x) \int 1 \cdot dx \right] dx$$ +1

$$I = \log x \times x - \int \left[\frac{1}{\cancel{x}} \times \cancel{x} \right] dx$$ +1

$$I = x \log x - \int 1 \cdot dx$$

$$I = x \log x - x + c$$ +2

$$I = x (\log x - 1) + c$$

Q5) (III) Let

$$I = \int_0^1 (2 + \sin 2x) \, dx$$

$$I = \{ \cancel{2x} \int_0^1 2 \, dx + \int_0^1 \sin 2x \, dx$$ +1

$$I = 2 [x]_0^1 + \left[- \frac{\cos 2x}{2} \right]_0^1$$ +1

$$I = 2 (1 - 0) - \frac{1}{2} (\cos 2 - \cos 0)$$ +1

$I = 2 - \frac{1}{2}(\cos 2 - 1)$ +1

$I = 2 + \frac{1}{2} - \frac{\cos 2}{2}$

$I = \frac{5}{2} - \frac{\cos 2}{2}$ Ans +1

Q6)

(I) Determinant is the rectangular arrangment of elements in rows and coloumns. for ex.

$$A = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$$ +1

properties of determinants.

(1) Any determinant can be solved or expand along any row or coloumn. +1

(2) The numerical value of determinant remains unchanged if rows are interchange with coloumn. but sign will be changed. +1

(3) If any two rows or coloumn of a determinant are identical then it's numerical value will be zero. +1

(4) If each element of any row or column of an determinant is zero i.e. 0 then value of determinant is also zero. +1

9b)
(II) Given
vertices of triangle are
A(0,0), B(0,-5) & C(8,0)
then

$$\text{Area} = \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$ +2

$$= \begin{vmatrix} 0 & 0 & 1 \\ 0 & -5 & 1 \\ 8 & 0 & 1 \end{vmatrix}$$ +1

on solving from R_1 +2

$0 - 0 + 1 \cdot (0 + 40)$

$= 40$ sq. unit.

Q.6)

(III) Given

$$x+y+z=6$$
$$x-y+z=2$$
$$x+2y-z=2$$

$$D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 2 & -1 \end{vmatrix}$$ +1

$$D = (1-2)-1(-1-1)+1(2+1)$$

$$D = -1+2+3$$ +1

$$\boxed{D=4}$$

$$D_1 = \begin{vmatrix} 6 & 1 & 1 \\ 2 & -1 & 1 \\ 2 & 2 & -1 \end{vmatrix}$$

$$D_1 = 6(1-2)-1(-2-2)+1(4+2)$$

$$D_1 = -6+4+6 = 4$$ +1

$$D_2 = \begin{vmatrix} 1 & 6 & 1 \\ 1 & 2 & 1 \\ 1 & 2 & -1 \end{vmatrix}$$

$$D_2 = (-2-2)-6(-1-1)+1(2-2) = 8$$ +1

$$D_3 = \begin{vmatrix} 1 & 1 & 6 \\ 1 & -1 & 2 \\ 1 & 2 & 2 \end{vmatrix}$$

$$D_3 = (-2-4) - 1(2-2) + 6(2+1)$$

$$D_3 = -6 + 18 = 12$$ +1

Now by Cramer's rule

$$x = \frac{D_1}{D} = \frac{4}{4} = 1$$

$$y = \frac{D_2}{D} = \frac{8}{4} = 2$$

$$z = \frac{D_3}{D} = \frac{12}{4} = 3$$

+1

$x = 1$, $y = 2$, $z = 3$ Ans