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XII – MATHEMATICS TERM 1- Practice Paper 02 (As Per Latest CBSE Guidelines) PAPER CODE:MC23-1202

INFINITY THINK BEYOND.....

AN EDUCATIONAL INSTITUTE

(SYLLABUS COVERED : Unit 1-Relations & Functions , Unit 2-Algebra , Unit 3 – Calculus , Unit 5- LPP)

Maximum Marks : 80 **Time : 3 hrs.**

General Instruction:

1. This Question paper contains five sections - A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.

2. Section A has 18 MCQs and 02 Assertion-Reason (A-R) based questions of 1 mark each.
Section B has 05 questions of 2 marks each.
Section C has 06 questions of 3 marks each.
Section D has 04 questions of 5 marks each.
Section E has 03 Case-study / Source-based / Passage-based questions with sub-parts (4 marks each)

Section A(1 Mark each)

1. **If A is a symmetric matrix, then which of the following is not Symmetric matrix,**
   (a) $A + A^T$ **(b)** $A.A^T$ **(c)** $A - A^T$ **(d)** A^T
2. **If** $[x-2 \quad 5+y]\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix} = 0$, **then** $x + y =$
   (a) 0 **(b) -2** **(c) -1** **(d) -3**
3. **If A is a non-singular square matrix of order 3 such that |A| = 3, then value of $|2A^T|$ is**
   (a) 3 **(b) 6** **(c) 12** **(d) 24**
4. **If** $A = \begin{bmatrix}6x & 8\\ 3 & 2\end{bmatrix}$ **is singular matrix, then the value of x is**
   (a) 3 **(b) -2** **(c) 0** **(d) 2**
5. $A^{-1} = \begin{bmatrix}3 & 1 & 2\\ 0 & 1 & 2\\ 0 & 2 & 1\end{bmatrix}$, **then** $|adjA| =$
   (a) $\frac{1}{9}$. **(b)** $\frac{-1}{81}$. **(c) -9** **(d) -81**
6. **The function given below at** $x = 4$ **is**
   $f(x) = \begin{cases}2x+3, x \le 4\\ x^2 - 5, x > 4\end{cases}$
   (a) Continuous but not differentiable
   (b) Differentiable but not continuous
   (c) Continuous as well as differentiable
   (d) Neither continuous nor differentiable
7. **If** $x = sin^3 t, y = cos^3 t$ **then** $\frac{dy}{dx}$

$(a)\ \tan t$ **(b)** $\cot t$ **(c)** $-\tan t$ **(d)** $-\cot t$

8. **The point which does not lie in the half plane 2x + 3y – 12 < 0 is**
   (a)(1,2) (b)(2,1) (c)(2,3) (d)(-3,2)

9. **Find the value of** $\int \frac{dx}{sin^2x\ cos^2x} dx$
   (a) $\tan x + \cot x + C$ **(b)** $\tan x - \cot x + C$ **(c)**$\tan x \cot x + C$ **(d)** $\tan x - \cot 2x + C$

10. $\int x^2 e^{x^3} dx$ **is equal to**
    (a) $\frac{1}{3}e^{x^3} + C$ **(b)** $\frac{1}{3}e^{x^4} + C$ **(c)** $\frac{1}{2}e^{x^3} + C$ **(d)** $\frac{1}{2}e^{x^2} + C$

11. **If m and n respectively are the order and degree of the differential equation** $\frac{d}{dx}\left(\frac{dy}{dx}\right)^4 = 0$ **then m + n is**
    (a) 1 (b) 2 (c) 3 (d) 4

12. **The integrating factor of the differential equation** $(1 - y^2)\frac{dy}{dx} + yx = ay$ **(–1<y<1) is**
    (a) $\frac{1}{y^2-1}$ **(b)** $\frac{1}{\sqrt{y^2-1}}$ **(c)** $\frac{1}{1-y^2}$ **(d)** $\frac{1}{\sqrt{1-y^2}}$

13. **If A is a non-singular matrix of order 3 and |A| = – 4, find |adj A|.**
    (a) 4 (b) 16 (c) 64 (d) 1 4

14. **If** $\frac{dy}{dx} = y\ sin\ 2x$ **, y(0) = 1, then solution**
    (a) y =$e^{sin^2 x}$ **(b) y = sin2 x (c) y = cos2 x (d) y = =**$e^{cos^2 x}$

15. **A is a skew-symmetric matrix and a matrix B such that B'AB is defined, then B'AB is a:**
    (a)symmetric matrix b) skew-symmetric matrix (c) Diagonal matrix (d)upper triangular symmetric

16. **If the objective function** $z = ax + y$ **is minimum at (1, 4) and its minimum value is 13, then the value of a is**
    (a) 1 (b) 4 (c) 9 (d) 13

17. **The bounded feasible region of an LPP is always a _____**
    (a) Convex Polygon
    (b) Concave Polygon
    (c) Either (a) or (b)
    (d) Neither (a) nor (b)
    (e)

18. **If** $y = tan^{-1}\sqrt{\frac{1-sinx}{1+sinx}}$ **= 1 then value of dy/dx at x = π/6**
    (a) ½ (b) –1/2 (c) 1 (d) -1

19. **Directions :In the following questions ,A statement of Assertion (A) is followed by a statement of Reason (R) .Mark the correct choice as .**
    Assertion (A) : Domain of f(x) = $\cos^{-1}$**2x + sin 2x is [-1, 1]**

Reason (R) : Domain of a function is the set of all possible values for which function will be defined.

(a) Both A and R are true and R is correct explanation of A.
(b) Both A and R are true but R is NOT the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is true.

20. Assertion(A): Consider a set A={a,b,c}. A: the no of reflexive relations on the set A is 2^9
Reason(R): the relation is said to be reflexive if x R x , x ∀ A
(a)Both A and R are true and R is correct explanation of A.
(b)Both A and R are true but R is NOT the correct explanation of A.
(c)A is true but R is false.
(d)A is false and R is true.

Section B(2 Mark each)

21. Evaluate

$$\sin^{-1}\left(\sin\left(-\frac{17\pi}{8}\right)\right)$$

OR

Find the value of the expression $\sin\left[cot^{-1}\{cos(tan^{-1}1)\}\right]$

22. Find the values of a and b such that the function defined by

$$f(x)=\begin{cases}5, if\ x\le 2\\ ax+b, if\ 2<x<10\\ 21, if\ x\ge 10\end{cases}$$

is a continuous function

23. Find the least value of 'a' such that function f given by $f(x)=x^2+ax+1$ is strictly increasing on $(1,2)$.

OR

It is given that at $x=1$ function x^4-62x^2+9x+9 attains maximum value on the interval $[0,2]$. Find the value of a.

24. Solve : $(x^2-yx^2)dy+(y^2+x^2y^2)dx=0$

25. Evaluate $\int_1^2 \frac{dx}{x(1+logx)}$

OR

$\int_0^1 \frac{x\,dx}{1+x^2}$

Section C(3 Mark each)

26.Evaluate the following integral

$$\int \frac{(x^2+1)}{(x^2+2)(x^2+3)}dx$$

27. Solve the differential equation

$$\frac{dy}{dx}+\frac{2xy}{1+x^2}=\frac{1}{(1+x^2)^2}$$

OR

Find the particular solution of the differential equation $\frac{dy}{dx}$ + y $\cot x$ = 4x $cosec\ x$ (x≠0) given that y=0 when x= $\frac{\pi}{2}$.

28. Find:

$$\int \frac{dx}{9x^2+6x+5}$$

OR

Evaluate:

$$\int \frac{5x+3}{\sqrt{x^2+4x+10}}dx$$

29. Solve the following problem graphically:

Maximize

$z = 15x + 10y$

Subject to the constraints:

$3x + 2y \leq 80,$

$2x + 3y \leq 10,$

$x \geq 0, y \geq 0$

30. Discuss the differentiability of the function f(x) = |x – 2| at x = 2

Or

Find the relationship between a and b so that the function defined by

f(x) = $\begin{cases} ax+1, if\ x \leq 3 \\ bx+3, if\ x > 3 \end{cases}$ is continuous at x = 3.

31. Evaluate the following integral

$$\int_{-1}^{2} |x^3 - x| dx$$

Section D(5 Mark each)

32.Let L be the set of all lines in XY plane and R be the relation in L defined as $R = \{(L1, L2): L1\ is\ parallel\ to\ L2\}$. **Show that R is an equivalence relation. Find the set of all lines related to the line** $y = 2x + 4$.

OR

Show that f : N → N, given by $f(x) = \begin{cases} x+1, \text{if } x \text{ is odd} \\ x-1, \text{if } x \text{ is even} \end{cases}$ **is both one-one and onto.**

33. Find the product of matrices $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ **and** $\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & 2 \\ 2 & 1 & 3 \end{bmatrix}$

with the help of it, solve the following system of linear equations:

$$x - y + z = 4$$
$$x - 2y - 2z = 9$$
$$2x + y + 3z = 1$$

34. Find and draw the area of region lying in the first quadrant enclosed by x-axis,

the line y = x and the circle $x^2 + y^2 = 32$**.**

35. If $y = \left(x + \sqrt{x^2 + a^2}\right)^n$ **then prove that** $\frac{dy}{dx} = \frac{ny}{\sqrt{x^2+a^2}}$

Or

If $log_e\left(\sqrt{x^2 + y^2}\right) = tan^{-1}\left(\frac{y}{x}\right)$ **then prove that** $\frac{dy}{dx} = \frac{x+y}{x-y}$

Section E(4 Mark each)

This section comprises 3 case study/passage based questions of 4 marks each with sub parts.

36. Read the following passage and answer the questions given below

The Relation between the height of the plant (y in cm) with respect to exposure to sunlight is governed by the following equation $y = 4x - \frac{1}{2}x^2$ where x is the number of days exposed to sunlight.

(i)	**What is the rate of growth of plant?**	**(1 mark)**
(ii)	**On which day the plant attain the maximum height.**	**(1 mark)**
(iii)	**What is the maximum height of the plant?**	**(2 mark)**

OR

What is the height of the plant after two days? **(2 mark)**

37. An organization conducted bike race under 2 different categories-boys and girls. Totally there were 250 participants. Among all of them finally three from Category 1 and two from Category 2 were selected for the final race. Ravi forms two sets B and G with these participants for his college project. Let B = {b1,b2,b3} G={g1,g2} where B represents the set of boys selected and G the set of girls who were selected for the final race. Ravi decides to explore these sets for various types of relations and functions.

1. **Ravi wishes to form all the relations possible from B to G. How many such relations are possible? (1 mark)**

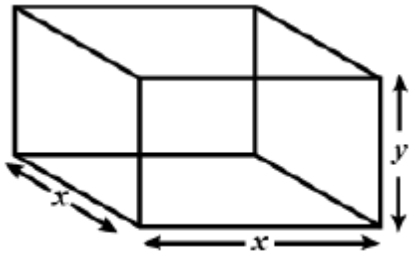
2. **Let R: $B \rightarrow G$ be defined by R = { (b1,g1), (b2,g2),(b3,g1)}. Check R is/are injective/ surjective/bijective.(1 Mark)**
3. **Ravi wants to find the number of injective functions from B to G. How many numbers of injective functions are possible(2 Mark)**

Or

Ravi wants to know among those relations, how many functions can be formed from B to G?(2 Mark)

38. Read the following passage and answer the questions given below

Anuja wants to make a project for State level Science Exhibition. For this she wants to make metal box with square base and vertical sides to contain of 1024 cm^3 water material for top and bottom costs ₹ 5 per cm^2 and material for slides costs ₹2.5 per cm^2.



(i) Find the volume of the box. (1 mark)

(ii) What is the cost of the box in terms of x? (1 mark)

(iii) Find the least cost of the box. (2 mark)

OR

Find the dimensions of the box having minimum surface area. (2 mark)

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