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XII – MATHEMATICS TERM 1- Practice Paper 03 (As Per Latest CBSE Guidelines) PAPER CODE:MC23-1203

INFINITY THINK BEYOND.....

AN EDUCATIONAL INSTITUTE

(SYLLABUS COVERED :Unit 1-Relations & Functions , Unit 2-Algebra , Unit 3 – Calculus , Unit 6- 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)

Q1 What is the number of all possible matrices of order 2×2 with each entry 1 ,2 or 3?

(a) 6 **(b)9** **(c)36** **(d)81**

Q2 If $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$ **,then value of x and y is**

(a) x=3 ,y=1 **(b) x=2,y=3** **(c) x=2,y=4** **(d) x=3,y=3**

Q3 If A and B are square matrices of order 3 such that |A|=-1, |B|=3 ,
Then value of |2AB| =

(a)6 **(b)-12** **(c)-24** **(d)12**

Q4 If for any 2×2 matrix A, A (adjA)= $\begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$**, then |A| =**

(a)6 **(b)36** **(c)12** **(d)24**

Q5 Given A = $\begin{bmatrix} 4 & 2 & 5 \\ 2 & 0 & 3 \\ -1 & 1 & 0 \end{bmatrix}$ **, what is the value of det(2A**A^{-1}**)?**

(a)4 **(b)8** **(c)6** **(d)10**

Q6 In the following function f(x) is continuous at x=0 , then what is the value of K

if $f(x) = \{\frac{sin\frac{3x}{2}}{x}, x \neq 0 , K \ \ when \ x = 0$

(a)$\frac{3}{2}$ **(b)** $\frac{-3}{2}$ **(c)3** **(d)NONE**

Q7 If $x = t^2$ and $= t^3$, then $\frac{d^2y}{dx^2}$ is equal to

(a) $\frac{3}{2}$ **(b)** $\frac{3}{4t}$ **(c)** $\frac{3}{2t}$ **(d)** $\frac{2}{3}$

Q8 Value of $\int_e^{e^2} \frac{dx}{xlogx}$ **=**

(a) loge (b)-loge (c)0 (d) log2

Q 9 $\int \frac{2dx}{1+cos2x}$ **is equal to**

(a) $cos^2x + C$ **(b)** $cosx + C$ **(c)** $sec^2x + C$ **(d)** $tanx + C$

Q10 What will be the number of arbitrary constants in general solution of a differential equation of fourth order

(a) No constant (b)2 (c)4 (d) 1

Q11 Find the degree of differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} + \sin\left(\frac{dy}{dx}\right)$ **+1=0**

(a) 0 (b)1 (c)2 (d) not defined

Q12 The function f : R → R given by f(x) = $x^3 - 1$ is

(a) a one-one (b) an onto (c) a bijection (d) neither one-one nor onto

Q13 The domain of the function defined by f (x) = $\sin^{-1}\sqrt{(x-1)}$ is

(a) [1, 2] (b) [-1, 1] (c) [0, 1] (d) None of these

Q14 The sum of two non-zero numbers is 8, the minimum value of the sum of their reciprocals is

(a) ¼ (b) ½ (c) 1/8 (d) None ofthese

Q15 The optimal value of the objective function is attained at the points:

(a) Given the intersection of inequations with the axes only
(b) Given by intersection of inequations with X-axis only
(c) Given by corner points of the feasible region
(d) None of these.

Q16 Corner points of the feasible region determined by the system of linear constraints are (0,3) ,(1,1) and (3,0) . Let Z =px+qy ,where p,q>0.Condition on p and q so that maximum of Z occurs at (3,0) and (1,1)

(a) p=2q (b)p=q/2 (c)p=3q (d)p=q

Q17 Corner points of the feasible region for an LPP are (0,2) ,(3,0),(6,0) ,(6,8) and (0,5). Let F= 4x+6y be the objective function. The minimum Value of F occurs at

(a)(0,2) only (3,0) only
(b)(0,2)only
(c) the mid point of line segment joining the points (0,2) and (3,0).
(d)any point on line segment joining the points (0,2) and (3,0).

Q 18 The function $f(x) = e^{|x|}$ is

(a)Continuous everywhere but not differentiable at x=0
(b)Continuous and differentiable everywhere
(c) Not continuous at x=0

(d) None of the above

Q19 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) : $sin^{-1}\left(sin\frac{2\pi}{3}\right)=\frac{2\pi}{3}$

Reason (R) : $sin^{-1}(sin\theta)=\theta$ **, if** $\theta\epsilon\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$ **,Then**

(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.

Q20 Assertion(A): f(x) = |sin x| is continuous x=0.
Reason(R): |sin x| is differentiable at x=0.
(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)

Q 21 Evaluate $\cos\left(tan^{-1}\frac{3}{4}\right)$.

OR

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

Q22 Find $\frac{dy}{dx}$ **if** $xy=e^{(x-y)}$.

Q23 The volume of a sphere is increasing at the rate of $8\frac{cm^3}{s}$**. Find the rate at which its surface increasing when the radius of the sphere is 12cm.**

Q24 find $\int\frac{sin^2x-cos^2x}{sin^2x\,cos^2x}dx$

Q25 Let f : R → R be the function defined by f (x) = $\frac{1}{2-cosx}\forall x\in R$**. Then, find the range of f . . .**

Section C(3 Mark each)

Q 26Evaluate : $\int_0^{\frac{\pi}{4}}\log(1+tanx)\,dx$

Q 27Evaluate $\int\frac{5x-2}{1+2x+3x^2}$**dx**

OR

Evaluate $\int_0^1 sin^{-1}x\,dx$

Q28 Find $\int\frac{x}{(1+x^2)(x-1)}dx$

Q 29 Solve the differential equation :

$xdy-ydx=\sqrt{x^2+y^2}dx$ **,given that y=0 when x=1.**

OR

Solve the differential equation $\frac{dy}{dx}$ -3ycotx=sin2x

Q30 Maximize $Z = x + 2y$. Subject to the constraints

$$x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200\ , x, y \geq 0.$$

Solve the above LPP graphically.

Q31 Prove that y =$\frac{4\sin\theta}{2+\cos\theta} - \theta$ is an increasing function of θ in [0, π/ 2] .

Section D(5 Mark each)

Q 32 Show that the relation R in set A ={1,2,3,4,5} given by R={(a,b) : |a-b|is divisible by 2} is an equivalence relation. Write all equivalence Classes of R.

OR

Let N denote the set of all natural numbers and R be the relation on N×N defined by (a,b) R(c,d) if ad(b+c) =bc(a+d).Show that R is an Equivalence relation.

Q33 $\int \frac{1}{\sqrt{\sin^3 x \sin(x+a)}}\, dx$

Q34 If A= $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 1 \end{bmatrix}$ **,find A^{-1}.Hence solve the system of equations**

$$x + y + z = 6, x + 2z = 7, 3x + y + z = 12.$$

Q 35 Find the area of the region enclosed by the parabola $x^2 = y$, the line y = x + 2 and the x-axis

OR

Find the area between the curves y = x and $y = x^3$.

Section E(5 Mark each)

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

Q 36 Sahaj wants to prepare a handmade gift for his father's birthday at Home. For making lower part of box, he takes a square piece of Cardboard of side 20cm.If x cm be the length of each side of the Square cardboard which is to be cut from corners from square piece of side 20 cm then

(i) **What is the volume function of open box formed by folding up the cutting corners?** (1 marks)

(ii) **At what rate the volume of box is changing?** (1 marks)

(iii) **Sahaj is interested in maximising the volume of the box. So what should be the value of x to be cut off so that volume of box is maximum?** (2 marks)

OR

What are the dimensions of the open box with maximum volume? (2 marks)

Q 37. A particle is moving along the curve represented by the polynomial f(x) =$(x-2)^2(x-1)$.Based on above information answer the following questions:

(i) **Find the rate at which the particle is moving.** (1 marks)
(ii) **What are the critical points of polynomial f(x)?** (1 marks)
(iii) **Find the interval where f(x) is strictly increasing.** (2 marks)

OR

Find the interval where f(x) is strictly decreasing. (2 marks)

Q 38. Raji visited the Exhibition along with her family. The Exhibition had a huge swing, which attracted many children. Raji found that the swing traced the path of a Parabola as given by $y = x^2$.

Answer the following questions using the above information.

(i) **Let f: {1,2,3,….}→{1,4,9,….} be defined by $f(x) = x^2$. Prove it is bijective.** **(2)**
(ii) **Check the function f: Z→Z defined by $(x) = x^2$ is injective , surjective.** **(2)**

or

Let f: $N \rightarrow R$ be defined by $f(x) = x^2$. Is f is onto ? Write Range of the function

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