KENDRIYA VIDYALAYA SANGATHAN (LUCKNOW REGION)

PRE BOARD EXAMINATION (2022-23)

CLASS XII

SUBJECT: MATHEMATICS (041)

TIME: 3 HRS. **MM: 80**

GENERAL INSTRUCTIONS:

1.This paper contains 5 sections A, B, C, D and E. All questions are compulsory. However, there are internal choices in some questions.

2.Section A contains 18 MCQs and two questions assertion –Reason based questions of **ONE** mark each.

3. Section B contains 5 VSA type questions of **TWO** marks each.

4. Section C contains 6 SA type questions of **THREE** marks each.

5. Section D contains 4 Long Answer type questions of **FIVE** marks each.

6. Section E contains 3 source based/case based questions of **FOUR** marks each with sub parts.

SECTION A
[Each question carries 1 mark]

1.If $|2x \ -\ 1\ 4\ 2| = |3\ 0\ 2\ 1|$ then x is

(a) 3 (b) 2/3 (c) 3/2 (d) -1/4

2.If a matrix has 8 elements ,then number of possible orders of the matrix can be

(a) 4 (b) 6 (c) 2 (d) none of these

3. $\int e^x$ dx is

(a) $4x^3$ (b) $1/5\ x^5$ (c) e^x (d) none of these

4. Given a square matrix A of order 3x3 ,such that IAI = 6,then the value of $|A.\ adj\ A|$ is

(a) 36 (b) 216 (c) 96 (d) none of these

5.Integrating factor for the solution of differential equation $\frac{dy}{dx}$ +2y tan x = sin x is

(a) $\sec^2 x$ (b) sec x (c) tan x (d) log I sec xI

6.The domain of the function $\sin^{-1}\sqrt{x-1}$ is

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

7.Let A = {a,b} .Then number of one- one functions from A to A possible are

(a) 2 (b) 4 (c) 1 (d) 3

8.If $\left|\vec{a}\right|$ =8, $\left|\vec{b}\right|$ =3 and $\left|\vec{a}.\vec{b}\right|$= 12√3 then the value of $\left|\vec{a}\ X\ \vec{b}\right|$ is

(a) 12 (b) 12√3 (c) 6 (d) none of these

9.The sum of order and degree(if exist) of the differential equation $\frac{d^2y}{dx^2} + 2(\frac{dy}{dx})^3 = e^x$

(a) 2 (b) 5 (c) 3 (d) none of these

10.The value of $\int_{-\pi}^{\pi} sin^3x\, cos^2x\, dx$ is

(a) 2 (b) 0 (c) -1 (d) none of these

11.If a line has direction ratios 2, – 1, – 2, determine its direction cosines:

(a) ⅓, ⅔, -⅓ (b) ⅔, -⅓, -⅔ (c) -⅔, ⅓, ⅔ (d) none of these

12.Derivative of $\frac{1}{(1-x)}$ with respect to x is

(a)-2 (b) $\frac{x}{(1-x)^2}$ (c) $\frac{1}{(1-x)^2}$ (d) none of these

13.The scalar projection of the vector 3i – j - 2k on the vector i+ 2 j - 3k is

(a) 7/√ 14 (b) 7/ 14 (c) 6/ 13 (d) 7/2

14.If a line makes angle , π/2,π/ 3 and π/ 6 with the positive direction of x, y and z-axis respectively, then its direction cosines are

(a) 0,√3/2,1/2 (b) 0,√3, 1 (c) 0, 1, √3 (d) 0,1/2,√3/2

15.If A and B are symmetric matrices of the same order, then (AB′ –BA′) is a

(a) Skew symmetric matrix (b) Null matrix (c) Symmetric matrix (d) None of these

16.Direction ratio of line joining (2, 3, 4) and (−1, −2, 1), are:

(a) (−3, −5, −3) (b) (−3, 1, −3) (c) (−1, −5, −3) (d) (−3, −5, 5)

17.If y = a $\sin^3$ t , x = a $\cos^3$t ,then $\frac{dy}{dx}$ at t = 3π/4 is

(a)-1 (b) - √3 (c) -1/√3 (d) 1

18.The value of 'k' for which the function f(x) ={$\frac{1-coscos\,4x}{8x^2}$, $x \neq 0$ k , $x = 0$ is continuous at x = 0 , is

(a) 0 (b) - 1 (c) 1 (d) 2

ASSERTION - REASON BASED QUESTIONS

Direction : In the following questions ,

A statement of Assertion (A) is followed by a statement of Reason (R) . Mark correct choice as,

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true ,R is not correct explanation of A

(C) A is true but R is false.

(D) A is false but R is true.

19.Let W be the set of words in the English dictionary . A relation R is defined on W as

R ={(x,y) $\in W \times W$ such that x and y have at least one letter in common.

Assertion (A) : R is reflexive.

Reason (R): R is symmetric.

(a) A (b) B (c) C (d) D

20.Consider the function f:R → R defined as f(x)= x^3

Assertion (A) : f(x) is a one -one function.

Reason (R): f(x) is a one -one function if co- domain =range.

(a) A (b) B (c) C (d) D

SECTION – B
[Each question carries 2 mark]

21.If A = [3 1 $-$ 1 2] Show that A^2 -5A + 7I = 0. Hence find A^{-1}

OR

Find the value of k if the area of triangle with vertices (k,0) , (4,0) and (0,2) is 4 square units.

22.Find the Vector equation of the line which passes through the point (-2,4,-5) and is parallel to the line $\frac{x+3}{2} = \frac{2-y}{5} = \frac{2z+3}{6}$

OR

Find the value of λ if $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are orthogonal given that $\vec{a} = \hat{i} - \hat{j} + 7\hat{k}$ and $\vec{b} = 5\hat{i} - \hat{j} + \lambda\hat{k}$

23.Evaluate: $\int \frac{dx}{x^2+3x+2}$

24.If the rate of change of volume of a sphere is equal to the rate of change of its radius, Then find the radius.

25.If x= a sec t , y= b tan t , then find $\frac{d^2y}{dx^2}$ at t =$\frac{\pi}{6}$

OR

If $x^y = y^x$, then $\frac{dy}{dx}$

SECTION – C
[Each question carries 3 mark]

26.Find the particular solution of the differential equation e^x tan y dx + (2 - e^x) $\sec^2 y$ dy = 0, given that y = π/4 when x = 0.

OR

Find the particular solution of the differential equation $2x^2\frac{dy}{dx}$ - 2xy + y^2 = 0; y(e) = e

(3)

27.Find the value of x

If $[1\ x\ 1\ ][1\ 3\ 2\ 2\ 5\ 1\ 15\ 3\ 2\ ][1\ 2\ x\ ] = 0$

28.Find the value of λ , so that the lines $\frac{1-x}{3} = \frac{7y-14}{2\lambda} = \frac{5z-10}{11}$ and $\frac{7-7x}{3\lambda} = \frac{y-5}{1} = \frac{6-z}{5}$ are perpendicular to each other.

29.Find the intervals at which the function f(x)=$2x^3$–$3x^2$–36x+ 7 is strictly increasing or strictly decreasing.

OR

Evaluate : $\int_{-1}^{2} \left|x^3 - x\right| dx$

30.Let Z be the set of all integers and R be the relation on Z defined as R = { (a, b) : a, b∈ Z and (a – b) is divisible by 5 }.Prove that R is an equivalence relation

31.If $\vec{\alpha} = 3\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{\beta} = 2\hat{i} + \hat{j} - 4\hat{k}$,Then express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$,Where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$.

SECTION – D
[Each question carries 5 mark]

32.Determine the product $[-4\ 4\ 4\ -7\ 1\ 3\ 5\ -3\ -1\ ][1\ -1\ 1\ 1\ -2\ -2\ 2\ 1\ 3\ ]$ and use it to solve the system of equations

x – y + z = 4

x – 2y – 2z = 9

2x + y + 3z = 1

33.Find the shortest distance between the following lines :

$\vec{r} = (1 + \lambda)\hat{i} + (2 - \lambda)\hat{j} + (\lambda + 1)\hat{k}$

$\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \mu(2\hat{i} + \hat{j} + 2\hat{k})$

OR

Show that the two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ are intersecting each other. Find the point of intersection of these lines. Also find the distance between (-1,2,3) and point of intersection of given lines

34.Find the area of the region bounded by the curve $x^2 = 4y$ and the line 4y = x + 2

35.Evaluate : $\int_0^{\pi/2} log\ sin\ x\ dx$

OR

Evaluate: $\int (\sqrt{cot\ x} + \sqrt{tan\ x})\ dx$

(4)

SECTION – E
[Each question carries 4 mark]

36.Three schools DPS, CVC and KVS decided to organize a fair for collecting money for helping the flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs. 25, Rs.100 and Rs. 50 each respectively. The numbers of articles sold are given as


School /Article	DPS	CVC	KVS
Handmade fans	40	25	35
Mats	50	40	50
Plates	20	30	40

Based on the information given above, answer the following questions by using matrix:

1.What is the total money (in Rupees) collected by the school DPS?
a. 700 b. 7,000 c. 6;125 d. 7875
2. What is the total amount of money (in Rs.) collected by schools CVC and KVS?
a. 14,000 b. 15,725 c. 21,000 d. 13,125
3. What is the total amount of money collected by all three schools DPS, CVC and KVS?
a. Rs. 15,775 b. Rs. 14,000 c. Rs. 21,000 d. Rs. 17,125

4. If the number of handmade fans and plates are interchanged for all the schools ,then what is the total money collected by all schools?

a. Rs. 18,000 b. Rs. 6,750 c.Rs. 5,000 d . Rs. 21,250

(5)

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

Based on the information given above, answer the following questions:

1.The rate of growth of the plant with respect to sunlight is____.

(a) $4x - {}^{1/2}\ x^2$ (b). 4 – x (c). x – 4 (d) none of these

2.What is the number of days it will take for the plant to grow to the maximum height?

(a)4 (b) 6 (c) 7 (d) 10

3.What is the maximum height of the plant?

(a)12 cm (b) 10 cm (c) 8 cm (d)6 cm

4. If the height of the plant is 7/2 cm, the number of days it has been exposed to the sunlight is _____.

(a) 2 (b)7 (c) 4 (d)3

38.Polio drops are delivered to 50K children in a district. The rate at which polio drops are given is directly proportional to the number of children who have not been administered the drops. By the end of 2nd week half the children have been given the polio drops. How many will have been given the drops by the end of 3rd week can be estimated using the solution to the differential equation $\frac{dy}{dx} = (\mathbf{50} - \mathbf{y})$ where x denotes the number of weeks and y the number of children who have been given the drops.

Based on the information given above, answer the following questions:

1.State the order of the above given differential equation

2.The solution of the differential equation $= \mathbf{k}(\mathbf{50} - \mathbf{y})$ is given by

(a)log | 50 – y| = kx + C (b) - log | 50 – y| = kx + C

© log | 50 – y| = log| kx |+ C (d) 50 – y = kx + C

3. The value of c in the particular solution given that y(0)=0 and k = 0.049 is.

(a)log 50 (b) log 1/50 (c)50 (d) -50

4. Which of the following solutions may be used to find the number of children who have been given the polio drops?

(a)$y = 50 - e^{kx}$ (b)$y = 50 - e^{kx}$ (c)$y = 50\ (1 - e^{-kx})$ (d) $y = 50\ (e^{kx} - 1)$

(6)