MOGA DEVI MINDA MEMORIAL SCHOOL BAGLA HISAR
SAMPLE PAPER (2019-20)

Time: 3Hrs   **MATHEMATICS-XII**   **M.M: 80**

Note: All questions are compulsory.

General Instructions:

  i.   All the questions are compulsory.

  ii. The question paper consists of 36 questions divided into 4 sections A, B, C, and D.

  iii. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4marks each. Section D comprises of 4 questions of 6 marks each.

  iv. There is no overall choice. However, an internal choice has been provided in three questions of 1 mark each, two questions of 2 marks each, two questions of 4 marks each, and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.

  v.   Use of calculators is not permitted.

Section - A

❖ **1 to 10 are multiple choice type questions. Select the correct options:**

1. If A and B are invertible matrices then which of the following is not correct:-

   (A) adj A = $|A|$ A^{-1} (B) det(A^{-1}) = $[$ det(A)$]^{-1}$ (c) $(AB)^{-1} = B^{-1} A^{-1}$ (D) $(A+B)^{-1} = B^{-1} + A^{-1}$

2. If A and B are two matrices of order 3 X m and 3 X n, respectively and m = n, then the order of matrix (5A – 2B) is

   (a) m x 3   (b) 3 x 3   (c) m x n   (d) 3 x n

3. The position vectors of the point which divides the join of points $2\vec{a} - 3\vec{b}$ and $\vec{a} + \vec{b}$ in the ratio 3 : 1 is

   (a) $\frac{3\vec{a} + \vec{b}}{2}$ (b) $\frac{7\vec{a} - 8\vec{b}}{4}$ (c) $\frac{3\vec{a}}{4}$ (d) $\frac{5\vec{a}}{4}$

4. Two events E and F are independent if P$(E) = 0.3, P(E \cup F) = 0.5$ $then P(E/F) - P (F / E)equals$

   (A) $\frac{2}{7}$ (B) $\frac{3}{35}$ (C) $\frac{1}{70}$ (D) $\frac{1}{7}$

5. Find the value of λ such that the vectors $\vec{a} = 2\hat{\imath} + \lambda\hat{\jmath} + \hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ are orthogonal

   (a) 0   (B) 1   (c) $^3/_2$ (d) $^{-5}/_2$

6. If cos (Sin^{-1} $\frac{2}{5}$ + cos^{-1} x) = 0, then x is equal to

    (a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) 0   (d) 1

7. The probability distribution of a discrete random variable x is given below:-

X	2	3	4	5
P(x)	$\frac{5}{k}$	$\frac{7}{k}$	$\frac{9}{k}$	$\frac{11}{k}$

    The value of k is

    (a) 8   (b) 16   (d) 32   (d) 48

8. $\int \frac{\cos 2x - \cos 2\theta}{\cos x - \cos \theta}$ dx equal to

    (a) $2(\sin x + x \cos\theta) + c$ (b) $2(\sin x - x \cos\theta) + c$

    (c) $2(\sin x + 2x \cos\theta) + c$ (d) $2(\sin x - 2x \cos\theta) + c$

9. If p and q are respectively degree and order of the differential equation:

    $\frac{d^2 y}{dx^2} + 3\frac{dy}{dx} + \frac{d^3 y}{dx^3} = 4$, the value of 2p + 3q is

    (a) 12   (b) 11   (c) 8   (d) not defined

10. Integrating factor of x $\frac{dy}{dx} - y = x^4 - 3x$ is :

    (a) x   (b) log x   (c) $\frac{1}{x}$ (d) $- x$

❖ **Q. 11 to Q 15 Fill in the blanks:-**

11. If f be the greatest integer function defined as f(x) = [x] and g be the modulus functions defined as g(x) = |x| , then the value of (gof) $(- \frac{5}{4})$ is ………………

12. If f(x) = $\begin{cases} ax + 1 & if\ x \geq 1 \\ x + 2 & if\ x < 1 \end{cases}$ is continuous, then a should be equal to ………………...

13. If x $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ + y $\begin{bmatrix} 3 \\ 5 \end{bmatrix}$ + $\begin{bmatrix} -8 \\ -11 \end{bmatrix}$ = 0 then x – y is …………………………..

14. The curves y = 4x^2 + 2x – 8 and y = x^3 – x + 13 touch each other at the point ………………..

OR

The maximum value of 3sin x + 2cos x is …………………

15. The projection of vector $\vec{a} = 2\hat{i} - \hat{7} + \hat{k}$ on $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ is ……………………

❖ **[Q – 16 to Q 20] Ans the following questions:-**

16. If A and B are matrices of orders 3 and | A| = 3 and |B| = 5, then find 3 |3AB|

17. Evaluate $\int_0^{\pi/2} log \frac{4+3\, Sinx}{4+3\, Cosx}\, dx$

18. Evaluate $\int e^x (\frac{1-x}{1+x^2})^2\, dx$

    OR

$\int (1 - 2\, sin^2 2\, x)\, dx$

19. Find the direction cosines of the line $\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$

20. Find the general solution of $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

(Section – B)

21. Find the value of

$tan^{-1} \left(-\frac{1}{\sqrt{3}} \right) + cot^{-1} \left(\frac{1}{\sqrt{3}} \right) + tan^{-1}(Sin \left(-\frac{\pi}{2} \right)]$

    OR

Let R be the relation in the set Z of integers given by R= {(a, b): 2divides a − b}. Show that the relation R transitive? Write the equivalence class {0}.

22. If x sin (a+ y) + sin a cos (a + y) = 0 prove that $\frac{dy}{dx} = \frac{sin^2\, (\, a+y)}{sin\, a}$

23. A stone is dropped into a quiet lake and waves move in circles at a speed of 4 cm / second. At the instant when the radius of circular wave is 10 cm, how fast is the enclosed area increasing ?

24. Find λ if the vectors $\hat{i} - \hat{j} + \hat{k}$, $3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} + \lambda\hat{j} - 3\hat{k}$ are coplanar.

    OR

Prove that $[\, \vec{a} + \vec{b}\, ,\, \vec{b} + \vec{c}\, ,\vec{c} + \vec{a} = 2\, [\, \vec{a}\, \vec{b}\, \vec{c}\,]$

25. If Mother, father and son line up at random for a family picture then find P($E/_F$) if

    E = son on one end, F : father in middle.

26. If A = $\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then find k so that A^2 = 8A + K I

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Section - C

27. Let f N $\longrightarrow$ R be defined by f(x) = 4x² + 12x +15 show that f: N $\longrightarrow$ S where S is the name of the function, is invertible. Also find the inverse of F.

28. If x = sin t and y = Sinpt prove that $(1 - x^2) \frac{d^2y}{dx^2} - x\frac{dy}{dx} + p^2y = 0$

OR

If y = a sint and X =a(cost + log tan$\frac{t}{2}$) Find $\frac{d^2y}{dx^2}$ at t = $\frac{\pi}{3}$.

29. Solve the differential equation $(tan^{-1}y - x) dy = (1 + y^2)dx$

30. $\int_{-1}^{3/2} | x \sin(\pi x)| dx$

31. Find the probability distribution of number of doublets in three throws of pair of dice.

OR

Bag 1 contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drown from Bag II. The ball so drawn is turned to be red in colour. Find the probability that the transferred ball is black.

32. A company manufactures two types of novelty souvenirs made of plywood. Souvenirs of type A require 5 minutes each for cutting and 10 minutes each for assembling. Souvenirs of type B require 8 minutes each for cutting and 8 minutes each for assembling. There are 3 hours 20 minutes available for cutting and 4 hours for assembling. The profit of Rs. 5 each for type A and Rs. 6 each for type B souvenirs. How many souvenirs of each type should the company manufacture in order to maximize the profit? Solve by using LPP.

Section - D

33. By using properties of determinants show that $\begin{vmatrix} (b+c)^2 & ba & ca \\ ba & (a+c)^2 & bc \\ ac & bc & (b+a)^2 \end{vmatrix}$ = 2abc (a + b + c)³

OR

Given A = $\begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$, B = $\begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$

Find BA and use this to solve the system of equations

Y + 2 Z = 7 , x – y = 3, 2x + 3y + 4 Z = 17

34. Using the method of integration find the area of the region
{ (X,Y) : Y² ≤ 4X , 4 X² + 4 Y² ≤ 9 }

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35. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$ Also find the maximum volume.

OR

Show that the semi vertical angle of the cone of the maximum volume and given slant height is $tan^{-1}\sqrt{2}$.

36. Find the distance of the point (-2,3,-4) from the line $\frac{X+2}{3} = \frac{2Y+3}{4} = \frac{3Z+4}{5}$ measured parallel to the plane 4x+12y-3z +1 = 0

OR

Find the equation of the plane through the intersection of the planes 2X +Y - 3Z =4 and 3X +4Y+8Z-1= 0 and making equal intercepts on coordinate axes.

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