D.A.V. INSTITUTIONS, CHHATTISGARH

PRACTICE PAPER-1 : 2023-24

CLASS – XII

SUBJECT- MATHEMATICS (041)

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

General Instructions:

1. **All questions are compulsory.**
2. **The question paper has five sections. Section–A, Section-B, Section-C, Section-D and Section–E. There are 38 questions in the question paper.**
3. **Section–A has 18 MCQ questions and 2 Assertion- Reason based question of 1 marks each. Section–B has 5 Very Short Answer (VSA) type questions of 2 marks each, Section-C has 6 Short Answer (SA) type questions of 3 marks each, Section–D has 4 Long Answer (LA) type questions of 5 marks each and Section–E has 3 case based questions of 4 marks each.**
4. **There is no overall choice. However internal choice have been provided in some questions. Attempt only one of the alternatives in such questions.**
5. **Wherever necessary, neat and properly labelled diagram should be drawn.**

Section- A (From question no. 1 to 20 Multiple Choice Question. Each question carry- 1 mark)

1) Vector of magnitude 12 units in the direction of vector $\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$ is

a) $4\hat{\imath} - 8\hat{\jmath} + 8\hat{k}$ b) $8\hat{\imath} - 4\hat{\jmath} + 8\hat{k}$ c) $4\hat{\imath} - 8\hat{\jmath} - 8\hat{k}$ d) $4\hat{\imath} + 8\hat{\jmath} + 8\hat{k}$

2) The solution set of the in equation 2 x + y > 5 is
(a) Half plane that contains the origin
(b) Open half plane not containing the origin
(c) Whole xy−plane except the points lying on the line 2 x + y = 5
(d)None of these

3) If A is a square matrix of order 3, such that A (adj A) = 10 I, then $|adjA|$ is equal to

a) 1 b) 10 c) 100 d) 101

4) A die is thrown twice and the sum of the numbers appearing is observed to be 8 .what is the conditional probability that the number 5 has appeared atleast once .
a) 4/5 b) 2/5 c) 3/5 d) 1/5

5) Evaluate the determinant $\begin{vmatrix} x-1 & 1 \\ x^3 & x^2+x+1 \end{vmatrix}$

a) 3 b) 0 c) -1 d) 1

6) The two lines x = ay +b, z = cy +d, and x = a'y + b', z = c'y + d' are perpendicular to each other, if

a) $\frac{a}{a'} + \frac{c}{c'} = 1$ b) $\frac{a}{a'} + \frac{c}{c'} = -1$ c) $aa' + cc' = 1$ d) $aa' + cc' = -1$

7) If A is a 3x3 matrix such that $|A| = 8$, then $|3A|$ equals

a) 8 b) 24 c) 72 d) 216

8) If $\vec{a} = \hat{\imath} - \hat{\jmath} + 7\hat{k}$ and $\vec{b} = 5\hat{\imath} - \hat{\jmath} + \mu\hat{k}$ then the value of μ, so that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular vectors is

± 3 b) ± 5 c) 3   d) 5

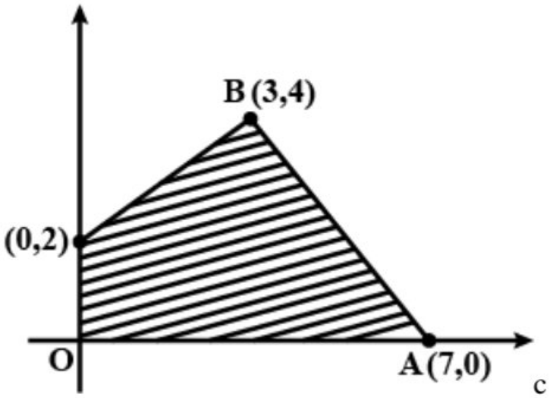
9) The direction ratios of the line passing through two points (2, -4, 5) and (0, 1, -1) is

a) (-2, -6, 5)   b) (-2, 5, -6)   c) (5, -2, -6)   d) (-6, -2, 5)

10) $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \frac{dx}{1+e^{\sin x}}$ is equal to

a) π b) $\frac{\pi}{2}$ c) $\frac{\pi}{4}$ d) $\frac{\pi}{3}$

11) The feasible region (shaded) for a L.P.P is shown in the figure. The maximum Z = 5x + 7y is



c

a) 43   (b) 45   (c) 47   (d) 49

12) The integrating factor of the differential equation x $\frac{dy}{dx}$ + 2 y = x^2 is

a) x   b) x^2 c) 3 x   d) xy

13) $\frac{d}{dx} \cos^{-1}\sqrt{\cos x}$, $0 < x < \frac{\pi}{2}$ is equal to

a) $\frac{\sqrt{1+\sec x}}{2}$ b) $\sqrt{1+\sec x}$ c) - $\frac{\sqrt{1+\sec x}}{2}$ d) - $\sqrt{1+\sec x}$

14) The degree of the differential equation $1 + (\frac{dy}{dx})^2 = x$ is

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

15) If A = $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ then the value of (A -2 I) (A – 3 I) is equal to

a) A   b) I   c) 5I   d) 0

16) The number of points of discontinuity of f defined by f(x) = $|x| - |x+1|$ is

a) 1   b) 2   c) 0   d) 5

17) $\int_0^{\frac{\pi}{8}} \tan^2(2x)$ dx is equal to

a) $\frac{4-\pi}{8}$ b) $\frac{4+\pi}{8}$ c) $\frac{4-\pi}{4}$ d) $\frac{4-\pi}{2}$

18) If $\vec{a}$, $\vec{b}$and $\vec{c}$ are three vectors such that $|\vec{a}| = 5$, $|\vec{b}| = 12$ and $|\vec{c}| = 13$ and

$\vec{a} + \vec{b} + \vec{c} = \vec{0}$, find the vector of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + c.\vec{a}$.

a) – 144   b) -25   c) -169   d) -49

Assertion- Reason Based Question

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R)

Choose the correct answer out of the following choices.

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

b) Both A and R are true and R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

19) Assertion (A) : A is a 2 x 2 matrix A = $[a_{ij}]$, whose elements are given by a_{ij} = i x j is $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$.

Reason : (R) If A is a 4 x 2 matrix, then the elements in A is 12

20) Assertion (A) : We can write $\sin^{-1} x = (\sin x)^{-1}$.

Reason (R) : Any value in the range of principal value branch is called principal value of that inverse trigonometric functions.

Section- B (From question no. 20 to 25. Each question carry- 2 mark)

21) If $\vec{a} = \hat{\imath}+\hat{\jmath}+\hat{k}$, $\vec{b} = 4\hat{\imath}-2\hat{\jmath}+3\hat{k}$, $\vec{c} = \hat{\imath}-2\hat{\jmath}+\hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$

OR

Find the angle between vectors $\vec{a}$ and $\vec{b}$, if $|\vec{a}| = \sqrt{3}, |\vec{b}| = 2, \vec{a}.\vec{b} = \sqrt{6}$

22) Find the value of $\tan^{-1}(1) + \cos^{-1}(\frac{-1}{2}) + \sin^{-1}(\frac{-1}{2})$

23) If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, prove that $\frac{dy}{dx} = -\frac{1}{(x+1)^2}$

24) Show that the function f defined by f(x) = (x -1) e^x+1 is an increasing function for all x> 0.

OR

Find a point on the parabola y^2 = 18 x at which the ordinate increases as twice the rate of the abscissa.

25) Find the value of P so that the lines $\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$ are at right angles.

Section- C (From question no. 26 to 31 Each question carry- 3 mark)

26) Solve the differential equation : $x\,dy - y dx = \sqrt{x^2+y^2}\ dx$.

OR Find the particular solution of the differential equation: $xdx - ye^y\sqrt{1+x^2}dy = 0$, given that y = 1 when x = 0.

27) Evaluate : $\int_0^{\pi} \frac{x \sec x}{\sec x + \tan x} dx$

OR

Evaluate : $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x} dx$

28) Evaluate : $\int \log(\log x) + \frac{1}{(\log x)^2} dx$

29) Out of a group of 8 highly qualified doctors in a hospital, 6 are very kind and cooperative with their patients and so are very popular, while the other two remain reserved. For a health camp, three doctors are selected at random. Find the probability distribution of the number of very popular doctors. What values are expected from the doctors?

30) Evaluate : $\int_0^1 x \tan^{-1} x \, dx$

31) Solve the following Linear Programming Problem graphically:
Maximize Z = 400x + 300y, subject to $x + y \le 200$, $x \le 40$, $x \ge 0$, $y \ge 0$

Section- D (From question no. 32 to 35 Each question carry- 5 mark)

32) If $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix}$, Find A^{-1} and hence solve the following system of equation:

$2x + y + 3z = 3, 4x - y = 3, -7x + 2y + z = 2.$

33) Define the relation R in the set $N \times N$ as follows: For (a, b), (c, d) ∈ $N \times N$, (a, b) R (c, d) if ad = bc. Prove that R is an equivalence relation in $N \times N$.

OR

Show that the relation R in the set A= {1,2,3,4,5} given by R = {(a,b): |a - b| is an even} is an equivalence relation. Show that all the element of {1,3,5} are related to each other and all the element of {2,4} are related to each other. But no element of {1,3,5} is related to any element of {2,4}.

34) Find the length and foot of the perpendicular drawn from the point (2,-1, 5) on the line

$\frac{x-11}{10} = \frac{y+2}{-4} = \frac{z+8}{-11}$.

OR

Find the shortest distance between the lines whose vector equation are

$\vec{r} = (1-t)\hat{\imath} - (2-t)\hat{\jmath} + (3-2t)\hat{k}$

$\vec{r} = (s+1)\hat{\imath} + (2s-1)\hat{\jmath} - (2s+1)\hat{k}$

35) Find the area of the smaller part of the circle $x^2 + y^2 = a^2$ cut-off by the line x = $\frac{a}{\sqrt{2}}$.

SECTION- E - Case Study Questions

(From question no. 36 to 38 Each question carry- 4 mark)

This section comprises of 3 case-study/passage-based questions of First two case study questions have three sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub parts of 2 marks each

Read the following passage and answer the questions given below.

36. A card is lost from a pack of 52 cards. From the remaining cards two cards are drawn at random.


Based on the above information answer the following question.

(i) Find the probability of drawing two diamonds, given that a card of diamond is missing.

(ii) Find the probability of drawing two diamonds, given that a card of heart is missing.

(iii). All of a sudden a missing card is found and two cards are drawn at random without replacement, find the probability that both drawn cards are kings.

OR

If two cards are drawn from a pack of 52 cards, one by one with replacement, then find the probability of getting not a king in 1^{st} and 2^{nd} draw.

37) .Rohan, a student of class XII, visited his uncle's flat with his father. He observe that the window of the house in the form of a rectangle surmounted by a semicircular opening having perimeter 10m

as shown in the figure

Based on the above information answer the following question.

(i) If x and y represents the length and breadth of the rectangular region, then find the relation between x and y for representing perimeter of window.

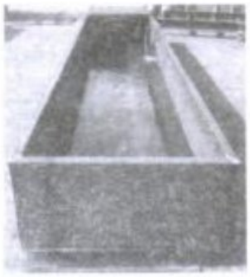
(ii) Find the area of the window in terms of x.

(iii) Rohan is interested in maximizing the area of the whole window, for this to happen, what will be the value of x when area will be maximum.

OR

Find the Maximum area of the window.

38) An open water tank aluminum sheet of negligible thickness, with square base and vertical sides, is to be constructed in a farm for irrigation. It should hold $32000l$ of water, that comes out from a tube well



Based on above information, answer the following questions

(i) Find the depth of the tank when outer surface area of tank will be minimum.

(ii) Find the minimum outer surface area of tank.

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