D.A.V. INSTITUTIONS, CHHATTISGARH

PRACTICE PAPER-7 : 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

(Multiple Choice Questions) Each question carries 1 mark

Q1. If A =[a_{ij}] is a skew-symmetric matrix of order n, then
(a) $a_{ij} = 1 \forall\ i, j$ (b) $a_j \neq 0\ \forall\ i, j$ (c) $a_{ij} = 0$, *where* $i = j$ (d) $a_{ij} \neq 0$ *where* $i = j$

Q2 The value of λ for which two vectors $2\hat{i} - \hat{j} + 2\hat{k}$ and $3\hat{i} + \lambda\hat{j} + \hat{k}$ are perpendicular is
(A) 2 (B) 4 (C) 6 (D) 8

Q3 The set of all points where the function $f(x) = x + |x|$ is differentiable, is
(A) $(0, \infty)$ (B) $(-,\infty 0)$ (C) $(-\infty, 0) \cup (0, \infty)$ (D) $(-\infty, \infty)$

Q4 If the direction cosines of a line are < $1/c$ $1/c$ $1/c$ >, then
(A)$0 < c < 1$ (B) $c > 2$ (C) c = +- √2 (D) +- √3)

Q5 Given that A is a square matrix of order 3 and $|A| = -2$, then $|adj\ (2A)|$ is equal to
(A) -2^6 (B) 4 (C) -2^8 (D) 2^8

Q6 The corner points of the bounded feasible region determined by a system of linear constraints are (0, 3), (1,1) and (3, 0). Let Z = $px + qy$, where $p, q > 0$. The condition on p and q so that the minimum of Z occurs at (3, 0) and (1, 1) is
(A) P= 2 q (B)p = q/2 (C) p = 3 q (D) p = q

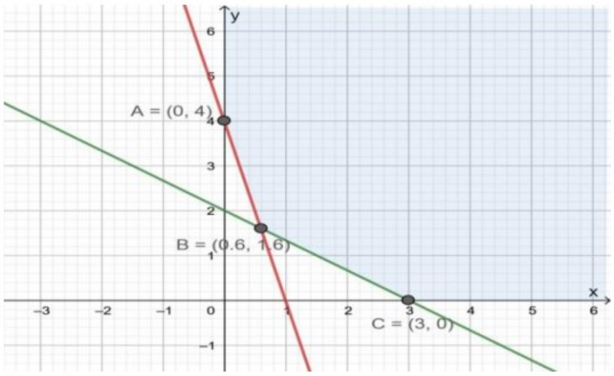
Q7. The solution set of the inequality $3x + 5y < 4$ is

(a) an open half-plane not containing the origin.
(b) an open half-plane containing the origin.
(c) the whole XY-plane not containing the line $3x + 5y = 4$.
(d) a closed half plane containing the origin.

Q8. The scalar projection of the vector $3\hat{i} - \hat{j} - 2\hat{k}$ *on the vector* $\hat{i} + 2\hat{j} - 3\hat{k}$ is
(a)7 (b)$\sqrt{14}$ (c)7/2 (d)2

Q 9. If A, B are non-singular square matrices of the same order, then $(AB^{-1})^{-1} =$
(a)$A^{-1}B$ (b)$A^{-1}B^{-1}$ (c)BA^{-1} (d) AB

Q10. The corner points of the shaded unbounded feasible region of an LPP are (0, 4), (0.6, 1.6) and (3, 0) as shown in the figure. The minimum value of the objective function Z = 4x + 6y occurs at



(a)(0.6, 1.6) *only* (b) (3, 0) only (c) (0.6, 1.6) and (3, 0) only
(d) at every point of the line-segment joining the points (0.6, 1.6) and (3, 0)

Q11. If A is a square matrix of order 3 and |A| = 5, then $|adjA|$ =
(a) 5 (b) 25 (c) 125 (d) $\frac{1}{5}$

Q12. Given two independent events A and B such that P(A) =0.3, P(B) = 0.6 and P($A' \cap B'$) is
(a) 0.9 (b) 0.18 (c) 0.28 (d) 0.1

Q13. The general solution of the differential equation $ydx - xdy = 0$ *is*
(a) $xy = C$ (b) $x = Cy^2$ (c) $y = Cx$ (d) $y = Cx^2$

Q14 If $y = sin^{-1}x$, then $(1 - x^2)y_2$ *is* equal to
(a) xy_1 (b) xy (c) xy_2 (d) x^2

Q15. If two vectors $\vec{a}$ *and* $\bar{b}$ are such that $|\vec{a}| = 2$, $|\vec{b}| = 3$ *and* $\vec{a}.\bar{b} = 4$, *then* $|\vec{a} - 2\bar{b}|$ is equal to
(a) √2 (b) 2√6 (c) 24 (d) 2√2

Q16. P is a point on the line joining the points $A(0,5,-2)$ and $B(3,-1,2)$. If the x-coordinateof P is 6, then its z-coordinate is

(a) 10 (b) 6 (c) -6 (d) -10

Q17 The general solution of the differential equation ydx – xdy = 0; (Given x, y > 0), is of the form
B. xy = c (B) x = cy2 (C) y = cx (D) y = cx2;
(Where 'c' is an arbitrary positive constant of integration)
Q18 The value of λ for which two vectors 2^i –^j + 2^k and 3^i + λ^j + ^k are perpendicular is
(A) 2 (B) 4 (C) 6 (D) 8

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement ofReason (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 but 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)*: The maximum value of the function $f(x) = x^5$, $x \in [-1, 1]$, is attained at its critical point, $x = 0$.

Reason (R): The maximum of a function can only occur at points where derivative is zero.

20. Assertion (A): The relation $f: \{1, 2, 3, 4\} \rightarrow \{x, y, z, p\}$ defined by $f = \{(1, x), (2, y), (3, z)\}$ is a bijective function.

Reason (R): The function $f: \{1, 2, 3\} \rightarrow \{x, y, z, p\}$ such that $f = \{(1, x), (2, y), (3, z)\}$ is one-one.

Section- B (2 MARKS EACH)

21 Solve the equation $\tan^{-1}x - \cot^{-1}x = \tan^{-1}1/\sqrt{3}$

22 Prove that the diagonal elements of skew symmetric matrix are al zero

23 if y = etan-1x find d2y/dx2 Or

If xy = ex-y prove that dy/dx = logx/ (1+ logx)2

24 Find the vectors whose length is 3 units and which is perpendicular to the vector

a= 3i + j – 4k and b = 6i+5j-2k

25 if a = 2i- j and b = 3i +2k find I a x bI

Or

If a and b are two vectors such that IaI = IbI = √2 and a. B = -1 find the angle between a andb

Section – C(3 MARKS EACH)

26 Find integrate $dx/\sqrt{(3-2x - x^2)}$

27 if $y^x = e^{y-x}$ then prove that $dy/dx = (1+\log y)^2/\log y$

Or

If x = sint and y= sinpt prove that $(1-x^2)d^2y/dx^2 - x dy/dx + p^2y = 0$

28 Evaluate $\int_0^4$ I x-1 I dx

29 Solve the differential equation $(x^2+xy)dy = (x^2+y^2)dx$

30 A box contains 9 red balls 5 blue balls and 6 green balls Three balls are drawn form the box at random Find the probability that

(a) All will be blue
(b) At least one will be green

31 Find graphically the maximum value of Z= 2x + 5y subject to the constraints below

2x+4y <= 8 3x+y <= 6 , x+y <=4 and x >= 0 and y >= 0

Section – D(4 MARKS EACH)

32 Find the equation of the two lines through the origin which intersect the line

(x-3)/2 = (y-3)/1 = z/1 at angles of π/3

Or

Find the shortest distance between the following pair of lines and determine whether they intersect or not

(x-5)/4 = (y-7)/-5 = (z+3)/-5 and (x-8)/7 = (y-7)/1 = (z-5)/3

33 Prove that the curves $y^2= 4x$ and $x^2= 4y$ divide the area of the square boundary x = 0 , x = 4 y = 0 and y = 4 into three equal parts

34 Consider f :R to [-0, ∞) given by f(x) = 5x2+6x -9 where R is the set of all non negative real numbers show that f is one-one and onto

Or

Define the relation R in the set NxN as follows

For (a,b) (c,d) € NxN (a,b) R (c,d) iff ad = bc Prove that r is the equivalence relation in the set NxN

35 If $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$ find A^{-1} Use A^{-1} to solve the following equation

$2x-3y+5z = 11$, $3x+2y-4z = -5$, $x+y-2z = -3$

Section-E

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

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

In an Office three employees Jayant, Sonia and Oliver process incoming copies of a certain form. Jayant processes 50%of the forms, Sonia processes 20% and Oliver the remaining 30% of the forms. Jayant has an error rate of 0.06, Sonia has an error rate of 0.04 and Oliver has an error rate of 0.03.

Based on the above information, answer the following questions.

i. Find the probability that Sonia processed the form and committed an error.

ii. Find the total probability of committing an error in processing the form.

iii. The manager of the Company wants to do a quality check. During inspection, he selects a form at random from the days output of processed form. If the form selected at random has an error, find the probability that the form is not processed by Jayant.

37.Read the following passage and answer the questions given below:

Teams *A, B,C* went for playing a tug of war game. Teams A,B,C have attached a rope to a metal ring and is trying to pull the ring into their own area.

Team *A* pulls with force $F = 6\hat{i} + 0\hat{j}$ kN,

Team *B* pulls with force $F = -4\hat{i} + 4\hat{j}$ kN,

Team *C* pulls with force $F_3 = -3\hat{i} - 3\hat{j}$ kN,

i. What is the magnitude of the force of Team *A*?

ii. Which team will win the game?

iii. Find the magnitude of the resultant force exerted by the teams.

OR

(iii) In what direction is the ring getting pulled?

38 Read the following passage and answer the questions given below: The relation between the height of the plant ('*y* ' in cm) with respect to its exposure to the sunlight is governed by the following equation $y = 4x - \frac{1}{2}x^2$, where ' *x* ' is the number of days exposed to the sunlight, for $x \leq 3$.

i. Find the rate of growth of the plant with respect to the number of days exposed to the sunlight.

ii. Does the rate of growth of the plant increase or decrease in the first three days? What will be the height of the plant after 2 days?