MODEL QUESTION PAPER-1

CLASS XII | MATHEMATICS (041) | SESSION 2022-23

Time Allowed: 3 Hours | Maximum Marks: 80

General Instructions:

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 based questions** of 1 mark each.
3. **Section B** has **5 Very Short Answer (VSA)-type** questions of 2 marks each.
4. **Section C** has **6 Short Answer (SA)-type** questions of 3 marks each.
5. **Section D** has **4 Long Answer (LA)-type** questions of 5 marks each.
6. **Section E has 3 source based/case based/passage based/integrated units of assessment** (4 marks each) with sub parts.

SECTION A

(MULTIPLE CHOICE QUESTIONS- EACH QUESTION CARRIES 1 MARK)

Q.1) If $\begin{bmatrix} x+y & 2 \\ x & 5 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 5 \end{bmatrix}$, then

(A) y=1 (B) y=2 (C) y=0 (D) y= - 1

Q.2) Let A be a non-singular matrix of order 3x3 and |A|=5, then the value of |adj A | is

(A) 5 (B) 25 (C) 125 (D) – 5

Q.3) The area of the parallelogram with vertices A, B, C, and D is given by

(A) $\left|\overrightarrow{AB} \times \overrightarrow{AC}\right|$ (B) $\frac{1}{2}\left|\overrightarrow{AB} \times \overrightarrow{AC}\right|$ (C) $\left|\overrightarrow{AB} \times \overrightarrow{AD}\right|$ (D) $\frac{1}{2}\left|\overrightarrow{AB} \times \overrightarrow{AD}\right|$

Q.4) The function $f(x)=\begin{cases}\frac{\sin x}{x}+\cos x; if\ x\neq 0\\ k \quad ; if\ x=0\end{cases}$; is continuous at x=0 then value of k is

(A) 3 (B) 2 (C) 1 (D) 1.5

Q.5) The value of $\int_{-1}^{2}|x|dx$ is

(A) 1 (B) 2 (C) 1.5 (D) 2.5

Q.6) The sum of the order and degree of the differential equation $\frac{d}{dx}\left[\left(\frac{dy}{dx}\right)\right]^3=y$ is

(A) 1 (B) 2 (C) 3 (D) 4

Q.7) 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.

Q.8) The direction cosine of vector $\hat{i}+\hat{j}-2\hat{k}$

(A) $-\frac{1}{\sqrt{6}},\frac{1}{\sqrt{6}},\frac{-2}{\sqrt{6}}$ (B) $\frac{-1}{\sqrt{6}},\frac{-1}{\sqrt{6}},\frac{2}{\sqrt{6}}$ (C) $\frac{2}{\sqrt{6}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{6}}$ (D) $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{-2}{\sqrt{3}}$

Q.9) The value of $\int_{\frac{\pi}{2}}^{\frac{\pi}{2}}\sin x\,dx$ is

(A) 1 (B) 0 (C) 3 (D) – 2

Q.10) If A and B are symmetric matrices of the same order, then matrix (AB'-BA') is

(A) Symmetric Matrix (B) Skew- Symmetric Matrix

(C) Zero Matrix (D) Identity Matrix

Q.11) The minimum value of objective function, Z = x + 2y at (5,10) is

(A) 20 (B) 25 (C) 5 (D) 35

Q.12) If $A=\begin{bmatrix} 4 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}, \textit{and if } A^{-1} \textit{exists, then}$

(A) $\lambda=2$ (B) $\lambda\neq 2$ (C) $\lambda=-2$ (D) $\lambda\neq -2$

Q.13) If the area of triangle with vertices (- 3, 0), (3,0) and (0, K) is 9 sq. units, then the value of K

(A) 9 (B) 3 (C) – 9 (D) 6

Q.14) If A and B are two events of a sample space such that P(A) = 0.4, P(B) = 0.3, P(A⋃B) = 0.5, then P (B⋂A) equals

(A) $\frac{2}{3}$ (B) $\frac{1}{2}$ (C) $\frac{3}{10}$ (D) $\frac{1}{5}$

Q.15) The general solution of differential equation $\frac{dy}{dx}=\sqrt{1-y^2}$ is

(A) $x=\sin^{-1}(x+C)$ (B) $y=\sin(x+C)$

(C) $y=\tan^{-1}(x+C)$ (D) $x=\log|y+\sqrt{1-y^2}|+C$

Q.16) 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

Q.17) If two vectors $\vec{a} \textit{ and } \vec{b}$ such that $|\vec{a}|=2, |\vec{b}|=3 \textit{ and } \vec{a}.\vec{b}=4, \textit{then} |\vec{a}-2\vec{b}|$ is equal to

(A) $\sqrt{2}$ (B) $2\sqrt{6}$ (C) 24 (D) $2\sqrt{2}$

Q.18) P is a point on the line segment joining the points (3, 2, -1) and (6, 2, -2). If x co-ordinate of P is 5, then its y co-ordinate is

(A) 2 (B) 1 (C) – 1 (D) – 2

ASSERTION-REASON BASED QUESTIONS

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.

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

(F) Both A and R is true and R is not the correct explanation of A

(G) A is true but R is false.

(H) A is false but R is true.

Q.19 **Assertion (A)**: The principal value of $\cos^{-1}\left(-\frac{1}{2}\right) is \frac{2\pi}{3}$.

Reason (R): $\cos^{-1}:(-1,1)\rightarrow[0,\pi]$ is a bijection map.

Q.20) **Assertion (A)**: Direction ratio of the normal to the plane 2x – 3y + 5z + 1=0 are 2, -3, 5.

Reason (R): Equation of a plane is $ax+by+cz+d=0$

SECTION B

This section comprises of very short answer type-questions (VSA) of 2 marks each

Q.21) Evaluate $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$

OR

Let $f:N\rightarrow N\, be\, defined\, by\, f(n)=\begin{cases}\frac{n+1}{2};if\ n\, is\, odd & \forall n\in N,\\ \frac{n}{2};if\ n\, is\, even\end{cases}$

State whether the function f is bijection. Justify your answer.

Q.22) A stone is dropped into a quiet lake and waves move in circles at the speed of 5 cm/s. At the instant when the radius of circular wave is 8 cm, how fast is enclosed area is changing.

Q.23) Find $\left|\vec{x}\right|$ if for a unit vector $\vec{a}, \left(\vec{x}-\vec{a}\right).\left(\vec{x}+\vec{a}\right)=12.$

OR

Find the sum of intercepts cut off by the plane 2x + y − z = 5, on the coordinate axes.

Q.24) If $y=e^{x}\left(\sin x+\cos x\right)$, then show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$..

Q.25) Find a unit vector perpendicular to each of the vector $\left(\vec{a}+2\vec{b}\right)$ and $\left(2\vec{a}+\vec{b}\right)$ where $\vec{a}=3\hat{i}+2\hat{j}+2\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}-2\hat{k}$

SECTION C

THIS SECTION COMPRISES OF SHORT ANSWER TYPE QUESTIONS (SA) OF 3 MARKS EACH

Q.26) Evaluate $\int \frac{5x+4}{\sqrt{x^2+4x+10}}dx$

Q.27) Three numbers are selected at random (without replacement) from first six positive integers. If X denotes the smallest of the three numbers obtained, find the probability distribution of X. Also find the mean of the distribution.

OR

Three friends go to a coffee shop. They decide who will pay the bill, by each tossing a coin and then letting the "odd person" pay. There is no odd person if all the three tosses produce the same result. If there is no odd person in the first round, they make a second round of tosses and they continue to do so until there is an odd person. What is the probability that exactly three rounds of tosses are made?

Q.28) Find $\int \frac{1}{\sin x+\sin 2x}dx$

Q.29) Find $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\cot x}}$ OR $\int_{-1}^{2} \left|x^3 - x\right| dx$

Q.30) Solve the differential equation $x\frac{dy}{dx}\sin\left(\frac{y}{x}\right)+x-y\sin\left(\frac{y}{x}\right)=0$

given that $x=1, when\, y=\frac{\pi}{2}$

OR

Q.31) Solve the following linear programming problem graphically.

Minimize Z = - 50x + 20 y

Subject to constraints: 2x − y≥−5; ; $3x+y\geq 3;$; 2x − y≤ 12 ;

$x\geq 0\, and\, y\geq 0$

SECTION D

(THIS SECTION COMPRISES OF LONG ANSWER-TYPE QUESTIONS (LA) OF 5 MARKS EACH)

Q.32) Using integration, find the area of the region bounded by the curves $\{(x,y):9x^2+y^2\leq 36\, and\, 3x+y\geq 6\}$

OR

Using the concept of integration find the area of the triangle formed by the positive x-axis and tangent and normal to the curve $x^2+y^2=4\, at\, (1,\sqrt{3})$.

Q.33) A relation R is defined on set N × N as follows:

For $(a,b),(c,d)\in NxN;(a,b)R(c,d)\, if\, fad=bc.$. Prove that R is an equivalence relation in $N\times N$

Q.34) Find the equation of the plane which contains the line of intersection of the planes $\vec{r}.(\hat{i}+2\hat{j}+3\hat{k})-4=0\, and\, \vec{r}.(2\hat{i}+\hat{j}+\hat{k})+5=0$ which is perpendicular to the plane $\vec{r}.(5\hat{i}+3\hat{j}-6\hat{k})+8=0$

OR

Find the equation of the line which intersects the lines $\frac{x+2}{3}=\frac{y-3}{2}=\frac{z+1}{4}$ *and* $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ which passes through the points (1,1,1).

Q.35) Use the product $\begin{bmatrix}1 & -1 & 2\\ 0 & 2 & -3\\ 3 & -2 & 4\end{bmatrix}\begin{bmatrix}-2 & 0 & 1\\ 0 & 2 & -3\\ 3 & -2 & -2\end{bmatrix}$ to solve the system of equations

x+3z=9; -x+2y-2z=4; 2x-3y+4z=-5

SECTION E

(This section comprises of 3 case-study/passage-based question of 4 marks each with two sub-parts. 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 subparts of 2 marks each)

Q.36) **Case-Study 1**: Read the following passage and answer the questions given below:

An Apache helicopter of enemy is flying along the curve $x=\sqrt{y-4}$. A soldier S is placed at point (3,4), and he shoots the helicopter when its nearest to him.

(i) Find the distance between soldier and the helicopter at any instant.

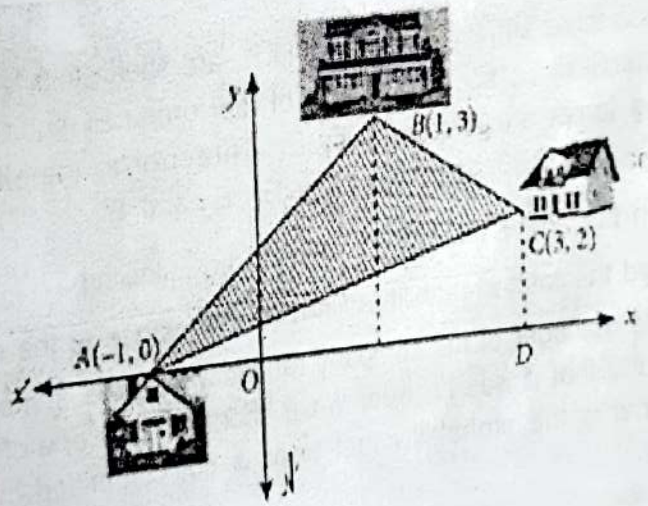
(ii) Find the coordinates of the helicopter when it was shot by the soldier S.

(iii) If nearest distance between Apache helicopter and soldier S is D. Determine the value of D.

OR

(iii) After the shot, the pilot of the helicopter jumped and ran away on the given position -time function, $x(t) = 4.9t^2 - 10t + 7$, find his speed after 2 seconds.

Case-Study 2: Read the following passage and answer the questions given below:



Location of three houses of a society is represented by the points A (-1, 0), B (1, 3) and C (3, 2) as shown in figure. (Use the concept of Integration to find area)

(i) Find the equation of line AB and BC.

(ii) Find the area of area of ABCD.

(iii) Find the value of (area of ABCD – area of ACD).

OR

(iii) If house of A were located at O (0,0), then Calculate the area of Δ OBC

Q.38) **Case Study 3**: Read the passage given below:

In an office three employee, E_1, E_2 and E_3 are shortlisting forms of candidates for an interview. E_1 shortlisted 50% of the forms, E_2 shortlisted 30%, while remaining forms are shortlisted by E_3. The error in the shortlisting work is 0.06, 0.04 and 0.03 respectively by E_1, E_2 and E_3.

Based on the above information answer the following:

(i) Find the total probability of error performance in the shortlisting work.

(ii) The manager of the company randomly selected a shortlisted form and found that it was an error while shortlisting by one of the employees. What is the probability that error is not committed by E_1.

SAMPLE QUESTION PAPER-2

CLASS XII SESSION 2022-23

MATHEMATICS (CODE-041)

Time Allowed: 3Hours **Maximum Marks: 80**

General Instructions:

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 based questions of 1 mark each.
3. **Section B** has 5 Very Short Answers (VSA) - type questions of 2 marks each.
4. **Section C** has 6 Short Answer (SA) - type questions of 3 marks each.
5. **Section D** has 4 Long Answer (LA) - type questions of 5 marks each.
6. **Section E** has 3 source based /case based/passage based/integrated units of assessment 4 marks each) with sub parts.

SECTION A

(MULTIPLE CHOICE QUESTIONS)

EACH QUESTION CARRIES 1 MARK

Q1. If A and B are matrices of same order, then (AB'-BA') is a

(A) Skew symmetric matrix (B) null matrix (C) symmetric matrix (D) Unit matrix

Q2. If A is the square matrix of order n, then adj(adj A) is equal to

(A) $|A|^{n-2}$ (B) $|A|^{n-2} A$ (C) $|A|^{n-1}$ (D) $|A|^{n-1} A$

Q3. Find the area of parallelogram ABCD is

(A) $\frac{1}{2}\left|\overrightarrow{AB}\, X\, \overrightarrow{AC}\right|$ (B) $\left|\overrightarrow{AB}\, X\, \overrightarrow{AC}\right|$ (C) $\left|\overrightarrow{AB}\, X\, \overrightarrow{AD}\right|$ (D) $\frac{1}{8}\left|\overrightarrow{AB}\, X\, \overrightarrow{AC}\right|$

Q4. The value of k which makes the function $f(x)=\begin{cases}\sin\frac{1}{x}, if\ x\neq 0\\ k, if\ x=0\end{cases}$ is continuous at x = 0

(A) 8 (B) 1 (C) -1 (D) none of above

Q5. If $f'(x)=e^{x\log x}(1+\log x)$ then what will be the function x ?

(A) xlogx (B) $(\log x)^x$ (C) x^x (D) xe^x

Q6. If m and n are, respectively, the order and degree of Differential Equation

$\frac{dy}{dx}\left[\frac{dy}{dx}\right]^4 = 0$, then m+n is

(A) 1 (B) 2 (C) 3 (D) 4

Q7. The solution set of inequality $2x-3y\leq -6$ is the half plane

(A) An open half plane containing origin.

(B) An open half plane not containing origin.

(C) The whole XY- plane not containing the given line.

(D) A closed half plane not containing the origin.

Q8. If $\vec{a}$ is a non zero vector of magnitude a and k is non zero scalar, the $k\vec{a}$ a unit vector if

(A) k = 1 (B) k = -1 (C) a = |k| (D) a = 1/|k|

Q9. The value of $\int_{-1}^{1}\sin^3 x\cos^2 x\,dx$ is

(A) 0 (B) -1 (C) 1 (D) π

Q10. If A and B are non-singular square matrices of same order, then $(AB^{-1})^{-1}$ is

(A) $A^{-1}B$ (B) $A^{-1}B^{-1}$ (C) BA^{-1} (D) AB

Q11. The corner points of feasible solution region determined by the system of linear constraints are (0.10), (5,5), (15,15), (0,20). Let Z=px+qy, where p, q>0. Condition on p and q so that the maximum of Z occurs both the point (15,15) and (0,20) is

(A) p = q (B) p = 2q (C) q = 2p (D) q = 3p

Q12. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & 5 \\ 8 & 3 \end{vmatrix}$, then find x.

(A) ±3 (B) -3 (C) 3 (D) ±2

Q13. If A is a square matrix of order 3 and |A|=5, then |adj A| =

(A) 5 (B) 25 (C) 125 (D) 1/5

Q14. Let A and B be two events such that P(A) = 0.6, P(B) = 0.2 and P(A/B) = 0.5 then P($\frac{A'}{B'}$) is

(A) 1/10 (B) 3/10 (C) 3/8 (D) 6/7

Q15. The general solution of differential equation ydx-xdy=0 is

(A) xy=C (B) $x=Cy^2$ (C) y=Cx (D) $y=Cx^2$

Q16. The function $f(x)=\frac{4-x^2}{4x-x^3}$ is

(A) Continuous at only one point.

(B) Continuous at exactly two points.

(C) Continuous at exactly three points.

(D) None of the above.

Q17. The projection of $\vec{a}=2\hat{i}-\hat{j}+\hat{k}$ along $\vec{b}=\hat{i}+2\hat{j}+2\hat{k}$ is

(A) 2/3 (B) 1/3 (C) 2 (D) $\sqrt{6}$

Q18. The co-ordinates of the foot of the perpendiculars drawn from the point (2,5,7) on the X-axis are given by

(A) (0,5,7) (B) (2,0,0) (C) (0,5,0) (D) (0,0,7)

ASSERTION-REASON BASED QUESTIONS

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 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.

Q19. **Assertion (A)**: $\sin^{-1}(-x) = -\sin^{-1}x; x \in [-1,1]$

Reason (R): $\sin^{-1} : [-1,1] \rightarrow \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is a bijection map.

Q20. Assertion (A): The points A(2,9,12), B(1,8,8), C(2,11,8), D(1,12,12) are the vertices of a rhombus

Reason (R): AB = BC = CD = DA and AC $\neq$ BD

SECTION B

This section comprises of very short answer type-questions (VSA) of 2 marks each

Q21. Find the value of $\cos^{-1}\left(\cos\frac{3\pi}{2}\right)$

OR

Prove the function f is surjective, where

$$f : N \rightarrow N \; such that \; f(n) = \begin{cases} \dfrac{n+1}{2}, n is odd \\ \dfrac{n}{2}, n is even \end{cases}$$

Is the function injective?

Justify your answer.

Q 22. A balloon, which always remains spherical, has a variable diameter $\frac{3}{2}(2x+1)$. Find the rate of change of its volume with respect to x.

23. If $\vec{a} = 5\hat{i} - \hat{j} + \lambda\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 7\hat{k}$, then for what value of λ the vectors $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$ are orthogonal.

OR

Find the direction cosines of a line which makes equal angles with the coordinate axes.

Q 24. If $x^y = y^x$, find dy/dx

Q 25. If $\vec{a}$ is a unit vector and $(\vec{y}+\hat{a}).(\vec{y}-\hat{a}) = 8$, find the value of $|\vec{y}|$.

SECTION C

(THIS SECTION COMPRISES OF SHORT ANSWER TYPE QUESTIONS (SA) OF 3 MARKS EACH)

Q 26. Find $\int \frac{1}{\sqrt{5-4x-x^2}}dx$

Q 27. Three friends go for coffee. They decide who will pay the bill, by each tossing a coin and then letting the "odd person" pay. There is no odd person if all three tosses produce the same result. If there is no odd person in the first round, they make a second round of tosses and they continue to do so until there is an odd person. What is the probability that exactly three rounds of tosses are made?

OR

Find the mean number of defective items in a sample of two items drawn one-by-one without replacement from an urn containing 6 items, which include 2 defective items. Assume that the items are identical in shape and size.

Q 28. Find $\int_0^{\pi/4} \frac{1}{\sqrt{1+\cot x}}dx$

OR

Evaluate $\int_{-5}^{5} |x+2|dx$

Q 29. $(x^2 - y^2)\,dx + 2xy\,dy = 0$

OR

Find the general solution of the differential equation $x\frac{dy}{dx}+2y=x^2$

Q 30. Solve the following Linear Programming Problem graphically:

Maximise Z = 3x+2y

Subject to constraints $3x+y\le 15, x+2y\le 10, x,y\ge 0$

Q 31. Find $\int \frac{x^2+1}{x^2-5x+6}dx$

SECTION D

(THIS SECTION COMPRISES OF LONG ANSWER-TYPE QUESTIONS (LA) OF 5 MARKS EACH)

Q 32. Find the area of the region $\{(x,y): 0\le y\le x^2+1, 0\le y\le x+1, 0\le x\le 2\}$ using Integration.

Q 33. Define the relation R in the set NXN as follows: For (a, b), (c, d) $\in NXN$,(a,b)R(c,d) iff ad=bc.. Prove that R is an equivalence relation in NxN..

OR

Given a non-empty set X, define the relation R in P(X) as follows: For A, B $\in$P(X), a, b "$\in R iff A\subset B$.. Prove that R is Reflexive and transitive but not symmetric.

Q 34. Two trains are running on the vector lines of $\vec{r}=\hat{i}+\hat{j}+\lambda(2\hat{i}-\hat{j}+\hat{k})\, and\, \vec{r}=2\hat{i}+\hat{j}-\hat{k}+\mu(3\hat{i}-5\hat{j}+2\hat{k})$: Find the shortest distance between them.

OR

Find the equation of the plane through the line of intersection of the planes $x + y + z = 1$ and $2x + 3y + 4z = 5$ which is perpendicular to the plane $x - y + z = 0$.

Q 35. If $\begin{bmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{bmatrix}$, find A^{-1} and use it to solve the system of equations.

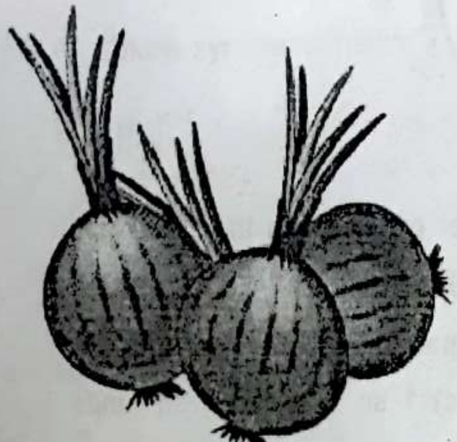
2/x+3/y+10/Z = 4, 4/X-6/Y+5/Z = 1, 6/X+9/Y-20/Z =

SECTION- E

(This section comprises 3 case studied/ passage based questions of 4 marks each with two sub parts. First case studies have three sub parts (i), (ii), and (iii) of marks 1, 1, and 2 respectively. The third case study has two sub parts of 2 marks each.)

Q 36. **Case Study-1**: Read the following passage and answer the questions given below.

The Government declares that farmers can get Rs.300 per quintal for their onions on 1st July and after that, the price will be dropped by Rs.3 per quintal per extra day. Shyams father has 80 quintal of onions in the field on 1st July and he estimates that crop is increasing at the rate of 1 quintal per day.



Based on the above information, answer the following questions.

(i) If x is the number of days after 1st July, then price and quantity of onion respectively can be expressed as

(a) Rs (300 - 3x), (80 + x) quintals (b) Rs. (300 - 3x), (80 - x) quintals

(c) Rs.(300 + x), 80 quintals (d) None of these

(ii) Revenue R as a function of x can be represented as

(a) $R(x) = 3x^2 - 60x - 24000$ (b) $R(x) = -3x^2 + 60x + 24000$

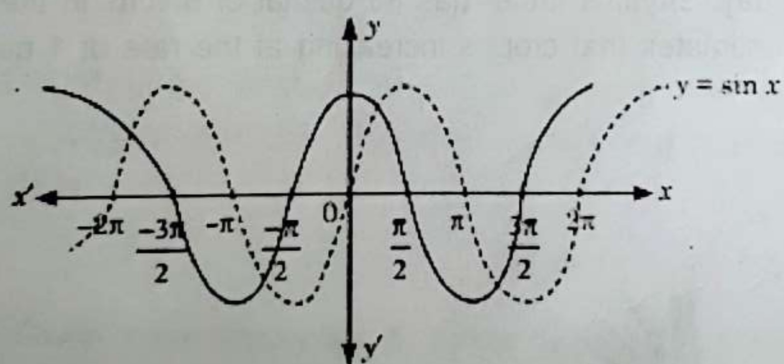
(c) $R(x) = 3x^2 + 40x - 16000$ (d) $R(x) = 3x^2 - 60x - 14000$

(iii) Find the number of days after 1stJuly, when Shyams father attain maximum revenue.

(a) 10 (b) 20 (c) 12 (d) 22

Q37. **Case-Study 2:** Read the following passage and answer the questions given below.

In a classroom, the teacher explains the properties of a particular curve by saying that this particular curve has beautiful ups and downs. It starts at 1 and heads down until π radian, and then heads up again and is closely related to sine function and both follow each other, exactly À/2 radians apart as shown in the figure



(i) Name the curve, which the teacher explained in the classroom.

(a) cosine (b) sine (c) tangent (d) cotangent

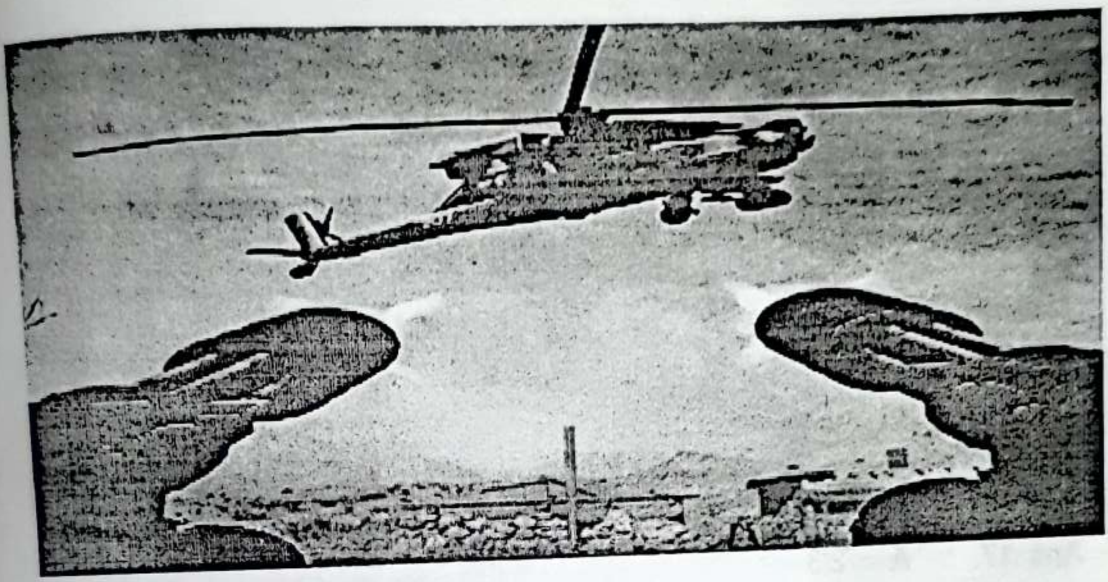
(ii) **Area of curve explained in the passage from 0 to $\pi/2$ is**

(a) 1/3 sq. unit (b) 1/2 sq. unit (c) 1 sq. unit (d) 2 sq. units

(iii) **The area of curve discussed in the classroom from $\pi/2$ to $3\pi/2$ is**

(a) –2 sq. units (b) 2 sq. units (c) 3 sq. units (d) –3 sq. units

Q 38. **Case-Study 3:** Read the following passage and answer the questions given below



There are two antiaircraft guns, named as A and B. The probabilities that the shell fired from them hits an airplane are 0.3 and 0.2 respectively. Both of them fired one shell at an airplane at the same time.

(i) What is the probability that the shell fired from exactly one of them hit the plane?

(ii) If it is known that the shell fired from exactly one of them hit the plane, then what is the probability that it was fired from B?

MARKING SCHEME SAMPLE PAPER

Ans 1. A Skew symmetric matrix

Ans 2. B $1|A|^{n-2} A$

Ans 3. C $\left|\overrightarrow{AB} \times \overrightarrow{AD}\right|$

Ans 4. D none of above

Ans 5. C x^x

Ans 6. C m = 2 and n = 1, m+n = 3

Ans 7. B An open half plane not containing origin.

Ans 8. D a = 1/|k|

Ans 9. A 0

Ans 10. C BA^{-1}

Ans 11. D Q = 3p

Ans 12. A ± 3

Ans 13. B 25

Ans 14. C 3/8

Ans 15. C y=Cx

Ans 16. C Continuous at exactly three points

Ans 17. A 2/3

Ans 18. B (2,0,0)

Ans 19. B Both A and R are true but R is not the correct explanation of A

Ans 20. D A is false but R is true

SECTION – B (VSA QUESTIONS OF 2 MARKS)

Ans 21. $\cos^{-1}(\cos\left(\pi+\frac{\pi}{2}\right)) = \cos^{-1}\left(-\frac{\cos\pi}{2}\right)$ 1

$= \cos^{-1}(0) = \pi/2$ 1

OR

To prove surjective 1

$F(1) = F(2) = 1, not\, injective$ 1

Ans 22. $V = 4/3\pi\left(\frac{d}{2}\right)^2 = 1/3\pi\left(\frac{3}{2}(2x+1)\right)^2 = \frac{3}{4}(2x+1)^2$ 1

$V' = 3(2x+1)$ sqcm/cm 1

Ans 23. Find $\left(\vec{a}+\vec{b}\right)$ and $(\vec{a}-\vec{b})$ 1

Putting the condition of orthogonality $\left(\vec{a}+\vec{b}\right).(\vec{a}-\vec{b}) = 0$ and 1

find $\lambda = \pm 5$

OR

$l = m = n$ and $l^2 + m^2 + n^2 = 1$ 1

$l = m = n = \frac{1}{\sqrt{3}}$

Ans 24. Taking log of both side ½

Do correct differentiation 1

Find dy/dx ½

Ans 25. $\left|\vec{a}\right| = 1$, open the dot product $\vec{y}.\vec{y} - \vec{a}.\vec{a} = 8$ 1

$\left|\vec{y}\right| - \left|\vec{a}\right|^2 = 8, \left|\vec{y}\right| = 3$ 1

SECTION C (SHORT ANSWER QUESTIONS OF 3 MARKS EACH)

Ans 26. Completing the square method 1

Using correct formula 1

Correct integration till last answer 1

Ans 27. P(not obtaining an odd person in a single round) =P(All three of them throw tails or All three of them throw heads = 1/2x1/2x1/2x2 =1/4 1+1/2

P(obtaining an odd person in a single round) = 1 - P(not obtaining an odd person in a single round) = ¾ 1/2

The required probability = P('In first round there is no odd person' and 'In second round there is no odd person' and 'In third round there is an odd person') = 1/4x1/4x3/4 = 3/64 1

OR

Let X denote the Random Variable defined by the number of defective items. 2

P(X=0) = 2/5, P(X=1) = 8/15, P(X=2) = 1/15 1+1

Table and Mean

Ans 28.	Use correct property	1
	Getting 2I	1
	Correct Integration	1
	OR	
	Correct parts of Integration	1
	Complete the Integration	1
	Answer	1
Ans 29.	Reducing the given DE in its correct form	½
	Apply the DE	1
	Do Integration	1
	Conclude	½

OR

Reducing the given DE in its correct form	½
Apply the DE	1
Do Integration	1
Conclude	1/2

Ans 30.	Correct graph	1
	Find correct corner points and make table	1
	Find correct value	1
Ans 31.	Correct division and get correct form of function for partial fraction	1
	Do correct partial fraction	1
	Do correct Integral	1

SECTION D

(LONG ANSWER TYPE QUESTIONS (LA) OF 5 MARKS EACH)

Ans 32.	Correct figure	1
	Point of Integration	1/2
	Write area as Integration formula	1
	Calculate area	2+1/2
Ans 33.	Reflexive	1
	Symmetric	1+1/2
	Transitive	2+1/2

OR

	Reflexive	1
	Transitive	2
	Not symmetric	2

Ans 34.	Find $\vec{a}_2 - \vec{a}_1$	1
	Find $\vec{b}_1 X \vec{b}_2$	1
	Formula	1
	Calculation	2

OR

Equation of intersection of planes in λ	1
Use property of perpendicularity	1
Find the value of λ	1
Find the final equation of plane.	2

Ans 35.	Find $\|A\|$	½
	Find adjA	3
	Find A^{-1} and get the values of x,y andz	1+1/2

SECTION E

(CASE STUDIES/PASSAGE BASED QUESTIONS OF 4 MARKS EACH)

Ans 36.	(i) A	1+1/2
	(ii) B	1+1/2
	(iii) A	1
Ans 37.	(i) A	1+1/2
	(ii) C	1+1/2
	(iii) B	1
Ans 38.	(i) 0.38	2
	(ii) 7/19	2