

- (c) $\log(\sec x + \tan x)$ (d) $\log(\sec x - \tan x)$
- 6 If m and n , respectively, are the order and the degree of the differential equation $\frac{d}{dx} \left[\left(\frac{dy}{dx} \right)^4 \right] = 0$, then $m - n =$ 1
- (a) 1 (b) -1 (c) 3 (d) 5
- 7 The scalar projection of the vector $2\hat{i} + 3\hat{j} - 5\hat{k}$ on the vector $5\hat{i} + 5\hat{j} + 5\hat{k}$ is 1
- (a) $\frac{2}{5\sqrt{3}}$ (b) 0 (c) 25 (d) None of these
- 8 The value of $\int_0^1 x \sqrt{1-x} dx$ is 1
- (a) -4/15 (b) 4/15 (c) -3/15 (d) 2/15
- 9 The value of $\int_a^{-a} \sin^3 x dx$ is 1
- (a) a (b) $a/3$ (c) 1 (d) 0
- 10 If A, B are non-singular square matrices of the same order, then $(A^{-1}B^{-1})^{-1}$ is 1
- (a) BA (b) AB (c) AB^{-1} (d) $A^{-1}B$
- 11 If $[2 \ 4 \ 5 \ 1] = [2x \ 4 \ 5 \ x]$, then the possible value(s) of 'x' is/are 1
- (a) 1 (b) -1 (c) 0 (d) a and b both
- 12 If A is a square matrix of order 3 and $|adj.A| = 25$, then $|A| =$ 1
- (a) 5 (b) -5 (c) 0 (d) a and b both
- 13 Given two independent events A and B such that $P(A) = 0.2$, $P(A \cup B) = 0.6$, then $P(B)$ is : 1
- (a) 0.5 (b) 0.6 (c) 0.7 (d) None of these
- 14 The point which does not lie in the half plane $2x + 3y - 12 \leq 0$ is: 1
- (a) (1, 2) (b) (2, 1) (c) (2, 3) (d) (-3, 2)
- 15 The general solution of the differential equation $\frac{dy}{dx} = e^x + 1$ is: 1

- (a) $y = e^x + c$ (b) $y = xe^x + c$ (c) $y = x + e^x + c$ (d) None of these
- 16 If x be the angle between two vectors \vec{a} and \vec{b} , then $|\vec{a} \cdot \vec{b}| = |\vec{a} \times \vec{b}|$ when x is equal to : 1
- (a) 0 (b) 30 (c) 45 (d) 90
- 17 Direction ratios of line given by : $\frac{x-1}{3} = \frac{2y+1}{10} = \frac{1-z}{-7}$ are: 1
- (a) $\langle 3, 10, -7 \rangle$ (b) $\langle 3, 5, 7 \rangle$ (c) $\langle 3, -5, -7 \rangle$ (d) $\langle -3, 20, -7 \rangle$
- 18 If $y = \log(\tan x)$, then dy/dx is: 1
- (a) $1/\tan x$ (b) $\sec^2 x / \tan x$ (c) $\sec x$ (d) $\sec x \tan x$

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.
- 19 Assertion (A) : The Domain of the function $\sec^{-1} x$ is $(-\infty, -1/2] \cup [1/2, \infty)$. 1
- Reason (R) : $\sec^{-1}(-\sqrt{2}) = \frac{3\pi}{4}$.
- 20 Assertion (A): The direction cosines of the vector $2\hat{i} + 3\hat{j} - 5\hat{k}$ are 1
- $\langle \frac{2}{\sqrt{38}}, \frac{3}{\sqrt{38}}, -\frac{5}{\sqrt{38}} \rangle$.
- Reason (R) : If $\langle a, b, c \rangle$ are direction ratios then direction cosines are $\langle \frac{a}{D}, \frac{b}{D}, \frac{c}{D} \rangle$, where $D = \sqrt{a^2 + b^2 + c^2}$.

SECTION - B

- 21 Find the value of $\cos^{-1}(\cos \cos \frac{13\pi}{7})$. 2

OR

Give an example of a relation, which is :

- (i) Reflexive, symmetric but not transitive
- (ii) Transitive but neither reflexive nor symmetric
- 22 Find the rate of change of the area of a circle with respect to its radius 'r' when r = 6 cm. 2
- 23 For what value of 'a' the vectors: $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $a\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear? 2

OR

Find the vector equation of the line which passes through the point (3, 4, 5) and is parallel to the vector $2\hat{i} + 3\hat{j} - 5\hat{k}$.

- 24 Find dy/dx if $2x + 3y = \sin y$. 2
- 25 Find 'k' when $(2\hat{i} + 6\hat{j} - 14\hat{k}) \times (\hat{i} + k\hat{j} + 7\hat{k}) = \vec{0}$ 2

SECTION - C

- 26 Evaluate: $\int \frac{2x}{(x^2+1)(x^2+2)} dx$ 3
- 27 Solve the differential equation $(x^2 - 1)\frac{dy}{dx} + 2xy = \frac{2}{x^2 - 1}$, where $x \in (-\infty, -1) \cup (1, \infty)$. 3
- 28 Evaluate : $\int_0^{\frac{3}{2}} |x \sin \sin \pi x| dx$ 3

OR

Evaluate $\int_{-1}^2 |x^3 - x| dx$.

- 29 Show that $(x - y)dy = (x + 2y) dx$ is a homogenous differential equation. Also, find the general solution of the given differential equation. 3

OR

Solve the following differential equation.

$$\sqrt{1 + x^2 + y^2 + x^2y^2} + xy \frac{dy}{dx} = 0.$$

- 30 Solve the following Linear Programming Problem graphically: 3

Maximize $Z = 5x + 2y$ subject to the constraints: $x - 2y \leq 2$, $3x + 2y \leq 12$, $-3x + 2y \leq 3$, $x \geq 0$, $y \geq 0$.

- 31 Find : $\int \frac{3x+5}{x^2+3x-18} dx$ 3

SECTION - D

- 32 Bag I contains 3 red and 4 black ball 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 drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black . 5
- 33 Let $f: W \rightarrow W$ be defined by: $f(n) = \{n - 1, \text{ if } n \text{ is odd } n + 1, \text{ if } n \text{ is even } \}$. Show that 'f' is one-one and onto . 5

OR

Let N denoted the set of natural numbers and R be the relation on $N \times N$ defined by: (a, b) R (c, d) if $ad(b + c) = bc(a + d)$. Show that R is equivalence relation.

- 34 Find the shortest distance between the following lines: 5

$$\vec{r} = 2\hat{i} + 6\hat{j} - 14\hat{k} + s(2\hat{i} + 6\hat{j} - 14\hat{k}) \text{ and}$$

$\vec{r} = 2\hat{i} + 6\hat{j} - 14\hat{k} + t(2\hat{i} + 6\hat{j} - 14\hat{k})$. Also find the equation of line joining the points from which the distance is shortest.

OR

Find the coordinates of the foot of perpendicular and the length of the perpendicular drawn from the point $P(5, 4, 2)$ to the line $\vec{r} = -\hat{i} + 3\hat{j} + \hat{k} + \lambda(2\hat{i} + 3\hat{j} - \hat{k})$. Also find the image of P in this line.

- 35 The cost of 4kg onion, 3 kg wheat and 2 kg rice is Rs 60. The cost of 2 kg onion, 4 kg wheat and 6 kg rice is Rs 90. The cost of 6 kg onion, 2 kg wheat and 3 kg rice is Rs 70. Find the cost of each item per kg by matrix method. 5

SECTION – E

- 36 A manufacture produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets. Annual sales are indicated below.



| <u>Market</u> | <u>Products (in numbers)</u> | | |
|---------------|------------------------------|---------------|------------------|
| | <u>Pencil</u> | <u>Eraser</u> | <u>Sharpener</u> |
| A | 10,000 | 2000 | 18,000 |
| B | 6000 | 20,000 | 8,000 |

If the unit Sale price of Pencil, Eraser and Sharpener are Rs. 2.50, Rs. 1.50 and Rs. 1.00 respectively, and unit cost of the above three commodities are Rs. 2.00, Rs. 1.00 and Rs. 0.50 respectively, then,

Based on the above information answer the following:

- (i). Find the total revenue of market A. 1
- (ii). Find the total revenue of market B. 1
- (iii). What is the Cost incurred in market A. 2

OR

Find the Gross profit in both markets

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



A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2 m and volume is 8 m^3 . If the building of tank costs Rs 70 per sq. meter for the base and Rs 45 per sq. meter for the sides.

- (i) What is the length of the tank for which construction cost is least? 1
- (ii) What is the breadth of the tank for which construction cost is least? 1
- (iii) What is the least cost of construction? 2

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

You want to make two gardens in the shape of square and circle in front of your house. If you purchase a wire of length 28m to fence these gardens and you have used x meters of wire to fence circular garden.



(i) What is the Radius of the circular garden and side of squared garden?

(ii) If you want to minimize the combined area of both gardens without wasting the wire of length 34m. Then How much length of the wire will be needed to fence the circular garden. And how much length of the wire will be needed to fence the squared garden?

2

2