BUDHA DAL PUBLIC SCHOOL PATIALA

SECOND TERM EXAMINATION (11 December 2023)

Class - XII

Paper-Mathematics (Set-A)

Time: 3hrs. **M.M. 80**

General Instructions:

1. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer type questions of 2 marks each.
4. Section C has 6 Short Answer type questions of 3 marks each.
5. Section D has 4 Long Answer type questions of 5 marks each.
6. Section E has 3 case based studies of 4 marks each.

Section - A

1. The value of $\int \frac{dx}{e^x+e^{-x}}$ is equal to

   a) $tan^{-1}(e^x)+c$ b) $tan^{-1}(e^{-x})+c$ c) $\log[e^x-e^{-x}]+c$ d) $\log[e^x+e^{-x}]+c$

2. $\int e^{\log \sin x}\, dx$ is equal to

   a) $\sin x + C$ b) $\cos x + C$ c) $-\cos x + C$ d) $-\sin x + C$

3. $f \frac{1}{sin^2\, cos^2 x}\, dx$ is equal to

   a) $\sin^2 x - \cos^2 x + C$ b) -1 c) $\tan x + \cot x + C$ d) $\tan x - \cot x + C$

4. $\int \frac{\tan^{-1} x}{1+x^2}\, dx$ is equal to

   a) $\frac{\pi^2}{16}$ b) $\frac{\pi^2}{32}$ c) $-\frac{\pi^2}{36}$ d) $\frac{\pi^2}{36}$

5. ${}_{-3}^{3}\int |x|\, dx$ is continuous

   a) 1 b) 3 c) 6 d) 9

6. The area bounded by Parabola $y^2 = x$ and straight line $2y = x$ is

   a) $\frac{4}{3}\ sq\ units$ b) $1\ sq\ units$ c) $\frac{2}{3}\ sq\ units$ d) $\frac{1}{3}\ sq\ units$

7. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right) + \left(\frac{dy}{dx}\right)^2 = x \sin\left(\frac{dy}{dx}\right)$ is

   a) 1 b) 2 c) 3 d) not defined

8. The order of differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{\frac{1}{4}} + x^{\frac{1}{8}} = 0$ is

   a) 2 b) 3 c) 1 d) not defined

9. The integrating factor is differential equation $\cos x \frac{dy}{dx} + y \sin x = 1$ is

a) $\cos x$ b) $\tan x$ c) $\sec x$ d) $\sin x$

10. A vector equally inclined to axes is

a) $i + j + k$ b) $i - j + k$ c) $i - j - k$ d) $-i + j - k$

11. What is the vector in direction vector $i - 2j + 2k$ that has magnitude 9 is

a) $i - 2j + 2k$ b) $\frac{i-2j+2k}{3}$ c) $3\,(i - 2j + 2k)$ d) $9\,(i - 2j + 2k)$

12. The value of λ such that vectors $\vec{a} = 2i + \lambda j + k$ *and* $\vec{b} = i + 2j + 3k$ are orthogonal is

a) 0 b) 1 c) $\frac{3}{2}$ d) $-\frac{5}{2}$

13. The sum of direction cosines of Z - axis is

a) 1 b) 0 c) 3 d) 2

14. If the line $\frac{x-2}{2k} = \frac{y-3}{3} = \frac{z+2}{-1}$ and $\frac{x-2}{8} = \frac{y-3}{6} = \frac{z+2}{-2}$ are parallel then value of k is

a) -2 b) $\frac{1}{2}$ c) 2 d) 4

15. The point which does not lie in the half plane $4x + 6y - 28 < 0$ is

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

16. 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

17. If A and B are two events such that $P(A) \neq 0$ *and* $P(B/A) = 1$ then

a) $A \subset B$ b) $B \subset A$ c) $B = \emptyset$ d) $A = \emptyset$

18. The probability distribution of random variable X is given below

X	0	1	2	3
P(X)	k	$\frac{k}{2}$	$\frac{k}{4}$	$\frac{k}{8}$

the value of k is

a) $\frac{1}{15}$ b) $\frac{2}{15}$ c) $\frac{6}{15}$ d) $\frac{8}{15}$

A-2

The following questions consists of two statements - Assertion (A) and Reason (R). Answer the question selecting appropriate option given below:

a) Both A and R are true and R is correct explanation for A.
b) Both A and R are true but R is not correct explanation for A.
c) A is true but R is false.
d) A is false but R is true.

19. **Q. 1. Assertion (A):** The area bounded by the circle $x^2 + y^2 = 16$ is 16π sq. units.
Reason (R): We have $x^2 + y^2 = 16$, which is a circle having centre at (0, 0) and radius 4 units.

20. Assertion (A) : If means $\vec{a} = 3i - 4j + 2k$ *and* $\vec{b} = 2i + 3j + 9k$ are mutually perpendicular then p *is* -9.
Reason (R) : For perpendicular vectors $\vec{a}.\vec{b} = 0$

Section - B

21. Find $\int \frac{sec^2x}{cosec^2x}\, dx$

22. Evaluate $\int_0^2 \sqrt{4 - x^2}\, dx$

23. Solve the following differential equation $\frac{dy}{dx} = x^3 cosec\, y$, given $y\,(o) = 0$

24. The x co-ordinate of a point on the line joining the points P (2, 2, 1) and Q (5, 1, -2) is 4. Find its Z-coordinate.

25. Two cards are drawn from well shuffled pack of 52 cards one after other without replacement. Find the probability that one of them is queen and other is king of opposite colours.

Section - C

26. Evaluate $\int \frac{2x^2+3}{x^2(x^2+9)}\, dx, x \neq 0$

27. Prove that $\int_0^1 sin^{-1}\frac{2x}{1+x^2}\, dx = \frac{\pi}{2} - \log 2$

28. Find solution of following differential equation $\frac{dy}{dx} = 1 + x + y + xy$

29. If vectors $\vec{a} = 2i + 2j + 3k$, $\vec{b} = i + 2j + k$ *and* $\vec{c} = 3i + j$ are such that $\vec{a} + \lambda \vec{b}$ is perpendicular to $\vec{c}$ then find value of 'λ'

30. Find the points on line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of 5 units from point P (1, 3, 5).

31. A family has 2 children. Find the probability that both are boys, if it is known that (i) at least one of the children is boy (ii) the elder child in a boy.

Section - D

32. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\cos x}{(1+\sin x)(2+\sin x)}\, dx$

33. Using the method of integration find area of ΔABC, coordinates of whose vertices are A (2, 0), B (4, 5) and C (6, 3)

34. Solve the following problem graphically minimize and maximize $z = 3x + 9y$ subject to the constraints

$$x + 3y \leq 60$$
$$x + y \geq 10$$
$$x \leq y \qquad x \geq 0, y \geq 0$$

35. Two cards are drawn simultaneously from a well shuffled pack of 52 cards. Find the mean of number of kings.

Section - E

36. Read the following and answer the questions.

A class XII student appearing for a competitive examination was asked to attempt the following questions.

Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three non zero vectors.

(*i*) If $\vec{a}$ and $\vec{b}$ are such that $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$ then how $\vec{a}$ and $\vec{b}$ are related?

(*ii*) If $\vec{a} = \hat{i} - 2\hat{j}$, $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$ then find $(2\vec{a} + \vec{b}) \cdot [(\vec{a} + \vec{b}) \times (\vec{a} - 2\vec{b})]$.

37. Read the following passage and answer the following questions.

A dealer Ramprakash residing in a rural area opens a shop to start his business. He wishes to purchase a number of ceiling fans and table fans. A ceiling fan costs him ₹360 and table fan costs ₹240.

(*i*) If Ramprakash purchases x ceiling fans, y table fans. He has space in his store for at most 20 items, than write its constraints.

(*ii*) If he expects to sell ceiling fan at profit of ₹22 and table fan for a profit of ₹18, then express the profit Z (in terms of x and y).

(*iii*) (*a*) If he sells all the fans that he buys, then write the number x, y of both the type of fans in stock to get maximum profit.

OR

(*iii*) (*b*) What is the maximum profit of selling all the fans?

038

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

In the office three employees Mehul, Janya and Charvi process incoming matter related to a particular project. Mehul processes 40% of the matter and Janya and Charvi process rest of the matter equally. It is found that 6% of matter processed by Mehul has an error where as for Janya and Charvi error rate is 4% and 3% respectively.

(*i*) Find the conditional probability that an error is committed in processing by Janya while processing the matter.

(*ii*) What is the probability that the matter processed by Janya has an error?

(*iii*) What is the probability of an error in processing the matter ?

OR

(*iii*) The processed matter is checked and the selected matter has an error, what is the probability that it was processed by Mehul?