Maths With Malini

BOARD PATTERN SAMPLE PAPER5

Class 12 - Mathematics

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

General Instructions:

This question paper contains 5 sections A,B,C, D and E ach section is compulsory however there are internal choices in some questions.

Section A has 18 MCQs and two Assertion -Reason based questions of 1 mark each.

Section B has five 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 four long answer LA type questions of 5 marks each.

Section E has three source based /case based/ passage based/ integrated units of assessment 4 marks each with subparts.

Section A

1. The sum of the vectors $\vec{a} = \hat{i} - 2\hat{k}, \vec{b} = -2\hat{i} + 4\hat{j} + 5\hat{k}\ and\ \vec{c} = \hat{i} - 6\hat{j} - 7\hat{k}$ is **[1]**

a) $-4\hat{j} + \hat{k}$
b) $-4\hat{j} - \hat{k}$
c) $4\hat{j} - \hat{k}$
d) $4\hat{j} + \hat{k}$

2. Suppose that five good fuses and two defective ones have been mixed up. To find the defective fuses, we test them one by one at random and without replacement. What is the probability that we are lucky and find both of the defective fuses in the first to tests? **[1]**

a) 1/10
b) 1/23
c) 1/11
d) 1/21

3. If lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ are mutually perpendicular then find the value of k. **[1]**

a) 10/7
b) -11/7
c) -13/7
d) -10/7

4. Let f: R->R be defined by $\begin{cases} 2x : x > 3 \\ x^2 : 1 < x \leq 3\ and\ 3x :\ if\ x \leq 1 \end{cases}$. Find f(-1)+f(2)+f(4). **[1]**

a) 7
b) 10
c) 8
d) 9

5. Evaluate $\int \frac{dx}{\sqrt{1-2x-x^2}}$ **[1]**

a) $\sin^{-1}x/\sqrt{2} + c$
b) $\cos^{-1}x/\sqrt{2} + c$

c) $\sin^{-1}[(X+1)/\sqrt{2}] + c$ d) $\cos^{-1}[(X+1)/\sqrt{2}] + c$

6. $\sin^{-1}\left(\frac{1}{2}\right) + 2\cos^{-1}\left(\frac{1}{2}\right) + 4cot^{-1}\left(\frac{1}{\sqrt{3}}\right)$ is equal to **[1]**

a) 4π/3 b) 13π/6

c) π/3 d) 3π/4

7. Evaluate: $\int (2tanx - 3cotx)^2 dx$ **[1]**

a) 4tanx-9cotx-25x+c b) -4tanx -9cotx-25x+c

c) 4tanx+9cotx+25x+c d) -4tanx+9cotx+25x+c

8. If $y = ae^x + be^{-x} + c$, where a,b,c are parameters, then y' is equal to **[1]**

a) $ae^x - be^{-x}$ b) $ae^x - be^{-x} + c$

c) $ae^x + be^{-x}$ d) $-(ae^x + be^{-x})$

9. The function f(X) = $\log(1+x) - \frac{2x}{2+x}$ is increasing on **[1]**

a) $(-\infty, \infty)$ b) $(-\infty, 0)$

c) None d) $(-1, \infty)$

10. The area of the region bounded by the lines Y= x + 1 and X =2, X = 3 is **[1]**

a) 7/2 sq units b) 13/2 sq units

c) 9/2 sq units d) 11/2 sq units

11. The degree of the differential equation $\left(\frac{d2y}{dx^2}\right)^{2/3} + 4 - 3\frac{dy}{dx} = 0$ is **[1]**

a) 1 b) 3

c) 0 d) 2

12. If $\vec{a}, \vec{b}, \vec{c}$ are position vectors of points A, B, C respectively such that , $5\vec{a} - 3\vec{b} - 2\vec{c} = 0$ then find the ratio in which C divides AB externally. **[1]**

a) 2:5 b) 5:2

c) 3:5 d) 1:3

13. Domain of $\cos^{-1}$[X] where [] denotes G.I.F is **[1]**

a) [-1,2) b) (-1,2]

c) [-1,2] d) None

14. If y = $\log_{10} x + \log_e y$, $then\ \frac{dy}{dx}\ is\ equal\ to$ **[1]**

a) $\frac{\log_{10} e}{x}\left(\frac{y-1}{y}\right)$ b) $\frac{y}{y-1}$

c) $\frac{\log_{10} e}{x}\left(\frac{y}{y-1}\right)$ d) y/x

15. Let R be a relation on the set N of natural numbers denoted by nRm where N is a factor of m, then R **[1]**

a) Reflex, transitive but not symmetric b) Equivalence relation

c) Reflexive and symmetric d) Transitive and symmetric

16. Evaluate $\int \left(e^{x\log a} + e^{a\log x} + e^{a\log a}\right) dx$ **[1]**

a) $\frac{a^x}{\log x} + \frac{x^{a+1}}{a+1} + a^a x + c$ b) $\frac{a^x}{\log a} + \frac{x^{a+1}}{a+1} + a^a x + c$

c) $\frac{a^x}{\log 9} + \frac{x^a}{a+1} + a^a x + c$

d) $\frac{a^x}{\log a} + \frac{x^{a+1}}{a-1} + ax^a + c$

17. If f is a real valued differentiable function satisfying $[(f(x)-f(y)]^{\leq} (x-y)^2$, x,yϵR and f(0)=0,then f(1) equals **[1]**

a) 0

b) 2

c) 1

d) -1

18. The order of the differential equation whose general solution is given by $y= (C_1+C_2)\cos(x+C_3) -C_4e^{x+C5}$ where C1 to C5 are arbitrary constants, is **[1]**

a) 5

b) 3

c) 4

d) 2

19. Assertion A: the unit vector in the direction of sum of the vectors **[1]**
$\bar{i} + \bar{j} + \bar{k}\,,\ 2\bar{i} - \bar{j} - \bar{k}\,, 2\bar{j} + 6\bar{k}\ is\ -\frac{1}{7}\left(3\bar{i} + 2\bar{j} + 6\bar{k}\right)$
Reason R: let $\vec{a}$be a non zero vector then $\frac{\vec{a}}{|\vec{a}|}$ is a unit vector parallel to $\vec{a}$.

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.

20. Let E1 and E2 the any two events associated with an experiment then **[1]**
Assertion A: P(E1)+P(E2)$\leq$ 1
Reason R: P(E1)+P(E2)+P(E1UE2).

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.

Section B

21. If A = $\begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and A adjA = AA^T, then find the value of 5a+b. **[2]**

OR

If A= $\begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix} and B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, then find $(AB)^{-1}$.

22. Prove that the area enclosed between the x-axis and the curve $y= x^2 -1$ is 4/3 sq units. **[2]**

23. If$\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}\ then\ find\ |\overrightarrow{a}\,x\overrightarrow{b}|$. **[2]**

OR

If $\overrightarrow{a} = \hat{i} + \widehat{j} + 2\hat{k}\ and\ \overrightarrow{b} = 2\hat{i} + \hat{j} - \hat{k}\ then$ find the unit vector in the direction of

i) $6\vec{b}$

ii) $2\vec{a} - \vec{b}$

24. Find the vector equation of the line passing through the point A(1, 2 ,- 1) and parallel to the line 5x- 25 = 14-7y = 35z. **[2]**

25. Random variable X has the following distribution **[2]**

X	1	2	3	4	5	6	7	8
P(X)	0.15	0.23	0.12	0.10	0.20	0.08	0.07	0.05

For the event E= {X is prime number} and F={X<4} find P(EUF).

Section C

26. Find the inverse of matrix $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ **[3]**

OR

Given $A = \begin{bmatrix} 2 & 4 & 0 \\ 3 & 9 & 6 \end{bmatrix} and B = \begin{bmatrix} 1 & 4 \\ 2 & 8 \\ 1 & 3 \end{bmatrix}$ Is (AB)' = (B'A')?

27. If y= $\sin^{-1}$x, then show that (1-x^2)$\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$ **[3]**

OR

If f(X) is continuous at X = 0, where

$\begin{cases} \frac{\sin x}{x} + \cos x, & for\ x > 0 \\ \frac{4(1-\sqrt{1-x})}{x}, & for\ x < 0 \end{cases}$, $then\ find\ f(0).$

28. Evaluate $\int_0^1 tan^{-1} x dx$ **[3]**

29. Find the solution of the differential equation $\frac{dy}{dx} = \frac{y(1+x)}{x(y+1)}$ **[3]**

OR

If dy/dx = sin(X+y) + cos(X+y), y(0)=0, then find $\tan\left(\frac{x+y}{2}\right)$

30. A vector has $\vec{r}$ magnitude 14 and direction ratios (2,3,-6) find the direction cosines and components of $\vec{r}$given that makes and acute angle with x axis. **[3]**

31. Find the foot of perpendicular from the point (2,3,-8) to the line $\frac{4-x}{2} = \frac{y}{6} = \frac{1-2}{3}$ .Also find the perpendicular distance from the given point to the line. **[3]**

Section D

32. Solve the following LPP graphically. **[5]**

Maximize Z= 150x+250y

Subject to constraints, X+y$\leq$35, 1000x+2000y$\leq$50000; X,y$\geq$0.

OR

Find the number of point(s) at which the objective function Z= 4x + 3y can be minimum subjected to the constraints 3x + 4y $\leq$24, 8x + 3y $\leq$48 , x$\leq$ 5, y$\leq$6:; x,y$\geq$0.

33. If A= $\begin{bmatrix} 23 & \\ 1 & -4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, verify that $(AB)^{-1}$= $B^{-1}A^{-1}$. **[5]**

34. Find $\int \sin^3 x \cos\frac{x}{2} dx$ **[5]**

OR

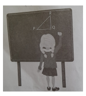
Evaluate $\int \frac{1}{\sin^4 x + \sin^2 x \cos^2 x + \cos^4 x} dx$

35. Show that y= log(X+$\sqrt{x^2+a^2}$)^2 satisfy the differential equation $\left(x^2+a^2\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0$ **[5]**

Section E

36. Case study 1: Read the following passage and answer the questions given below. **[4]**

In the math class, the teacher asked a student to construct a triangle on a blackboard and name it as PQR.Two angles P and Q where given to be equal to $tan^{-1}\left(\frac{1}{3}\right)\ and\ \tan^{-1}\left(\frac{1}{2}\right)$ respectively.



i) find the value of cos(P+Q+R).

ii) find the value of cos P + sin P.

iii) find the value of $\sin^2$P + $\sin^2$Q.

OR

If P = $\cos^{-1}x$, then find the value of $10x^2$.

37. Case study 2:Read the following passage and answer the questions given below: **[4]**

A night before sleep grandfather gave a puzzle to Rohan and Payal .The probability of solving this specific puzzle independently by Rohan and Payal are 1/2and 1/3 respectively.

i) find the probability that both solved the puzzle.

ii) find the probability that puzzle is solved by Rohan but not by Payal.

iii) find the probability that puzzle is solved.

OR

Find the probability that exactly one of them solved the puzzle.

38. Case study 3: Read the following passage and answer the questions given below; **[4]**

A Concert is organised every year in the stadium that can hold 42000 spectators with ticket price of rs 10 . The average attendance has been 27000. Some financial expert estimated that price of a ticket should be determined by the function $p(x) = 19 - \frac{x}{3000}$ where X is the number of tickets sold.

i) find the range of X and revenue R as a function of x.

ii) find the value of x for which revenue is maximum.