FIRST PRE-BOARD EXAMINATION:2020-21

CLASS : XII

SUBJECT:-MATHEMATICS

Max Marks:-80 **Time: - 3 hours**

General instructions

(i) This question paper consists of two parts A and B. Each part is compulsory. Part A carries 24 marks and part B carries 56 marks.
(ii) Part A has objective type questions and part B has descriptive type questions.
(iii) There is no overall choice. However, an internal choice has been provided in both the parts A and B.

PART – A :

1. This part consists of two sections- I and II.
2. Section I comprises of 16 very short answer type questions.
3. Section II contains 2 case studies. Each case study comprises of 5 case based MCQs. An examinee is to attempt any 4 out of 5 MCQs.

PART- B :

1. This part consists of three sections- III, IV and V.
2. Section III contains 10 questions of 2 marks each.
3. Section IV contains 7 questions of 3 marks each.
4. Section V contains 3 questions of 5 marks each
5. Internal choice is provided in 3 questions of section- III, 2questions of section-IV and 3 questions of section –V. You have to attempt only one of the alternatives in all such questions.

PART A

SECTION-I

1. Let A={1,2,3,4}. Let R be the equivalence relation on AxA defined by (a,b)R(c,d) iff a+d=b+c. Find the equivalence class [(1,3)].
2. State the reason why the relation *R* = {(*a*, *b*) : $a < b^3$} on the set *R* of real

number is not reflexive.

3. Find the value of $\sin^{-1}[\cos(43\pi/5)]$.

OR

Write the range of one branch of $\sin^{-1}x$, other than the principal value branch.

4. Let R is a relation in the set A={1,2,3} given by R={(1,2),(2,1)}, write the pair of element(s) to add so that relation become transitive.

OR

Check whether the function f:R→R given by f(x)= cosx is one –one or not.

5. Find the value of A^2, where A is a 2x2 matrix whose elements are given by $a_{ij}=\begin{cases} 1 \; if \;\; i \neq j \\ 0 \; if \;\; i = j \end{cases}$

OR

Given that A is a square matrix of order 3x3 and |A|= -5. Find |adjA|.

6. If $\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$ then find the value of a-3b.

7. If A and B are squre matrices of order 3 each, |A|=2 and |B|=3. Find the value of |3AB|.

8. Find the sum of the order and the degree of differential equation $\frac{d^2y}{dx^2} + \sqrt[3]{\frac{dy}{dx}} + (5+x) = 0.$

9. Evaluate $\int_0^1 \frac{tan^{-1}x}{1+x^2}dx$

OR

Evaluate $\int_e^{e^2} \frac{dx}{xlogx}$

10. Write the vector equation of line through the point (5,2,-7) and which is parallel to the vector $3\hat{\imath} + 4\hat{\jmath} - 11\hat{k}$.

11. Find the intercept cut off by the plane x-y+5z=7 on x and z axis.

12. Let $\bar{a} = 2\hat{\imath} - \hat{\jmath} + 2\hat{k}$ and $\bar{b}$= $-\hat{\imath} + \hat{\jmath} - \hat{k}$, find the unit vector in the direction of $\bar{a} + \bar{b}$.

13. Find the area bounded by $y=x^2$, the x axis and the lines x=-1 and x=1.

14. Find the direction cosines of the normal to yz plane?

15. Evaluate: P(A∪B); if 2P(A)=P(B)=5/13 and P(A|B)=2/5.

16. Let A and B be events with P(A)=3/5, P(B)=3/10 and P(A∩B)=1/5. Are A and B are independent? Justify.

Section II

Both the Case Study based questions are compulsory. Attempt any 4 sub parts from each question. (Each question carries 1 mark).

17. An insurance company insure three type of vehicles *i.e.,* type *A*, *B* and *C*. If it insured 12000 vehicles of type *A*, 16000 vehicles of type *B* and 20,000 vehicles of type *C*. Survey report says that the chances of their accident are 0.01, 0.03 and 0.04 respectively.
Based on the informations given above, write the answer of following:

(i) The probability of insured vehicle of type *C* is
(a) 5/12 (b) 4/12 (c) 7/12 (d) 3/12

(ii) Let *E* be the event that insured vehicle meets with an accident then $P(\frac{E}{A})$ *is*
(a) 0.09 (b) 0.01 (c) 0.07 (d) 0.06

(iii) Let E be the event that insured vehicle meets with an accident then *P* (*E*) is
(a) 38/1200 (b) 32/1200 (c) 24/1200 (d) 35/1200

(iv) The probability of an accident that one of the insured vehicle meets with an accident and it is a type *C* vehicle
(a) 2/7 (b) 3/7 (c) 5/7 (d) 4/7

(v) One of the insured vehicles meets with an accident and it is not of type *A* and *C*.
(a) 12/35 (b) 20/35 (c) 1/35 (d) 17/35

18. In a park, an open tank is to be constructed using metal sheet with a square base and vertical sides so that it contains 500 cubic meter of water.
Using above informations answer the following:

(i) If the edge of square is *x* meter and height of tank is *y* m then correct relation is
(a) $x^2y=500$ (b) $xy=500$ (c) $x^2y^2=500$ (d) $x^2 + y =500$

(ii) Relation for surface area of tank in terms of *x* and *y* is
(a) $2x^2 + 4xy$ (b) $x^2 + xy$ (c) $2x^2 + 2xy$ (d) $x^2 + 4xy$

(iii) The surface area of tank is minimum when *x* is equal to
(a) 8 m (b) 20m (c) 10m (d) 5m

(iv) The minimum surface area of tank is
(a) 200 sq m (b) 300 sq m (c) 250 sq m (d) 400 sq m

(v) If size of square base of tank become twice and height remains same, then the volume

of tank will increase by cubic meters *i.e.,*
(a) 500 cu m (b) 1000 cu m (c) 1500 cu m (d) 2000 cu m

Part B

Section III (Two marks questions)

19. Express $\tan^{-1}\left(\frac{cosx-sinx}{cosx+sinx}\right), 0 < x < \pi$.
20. If A is square matrix of order 3 such that $A^2=2A$, then find the value of |A|.
OR
If A=$\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2-5A+7I=0$. Hence find A^{-1}.
21. Consider $f : R_+ \to [4, \propto)$ given that $f(x) = x^2 + 4$. Show that f is one-one and onto.
22. Find the value(s) of k so that the following function is continuous at x=$\pi/2$
$$f(x)=\begin{cases} \frac{kcosx}{\pi-2x}, if\ x \neq \pi/2 \\ 2, \quad if\ x = \pi/2 \end{cases}$$
23. Find equation of tangent to the curve y= cosx at x=$\frac{\pi}{3}$.
24. Evaluate $\int \frac{dx}{x^2(x+1)}$
OR
Find $\int \frac{dx}{e^x+e^{-x}}$.
25. Find the area of the region bounded by $y^2=8x$ and the line x=3.
26. Solve the differential equation: $\frac{dy}{dx} = -4xy^2$ given that y(0)=1.
27. A black and a red dice are rolled together. Find the conditional probability of obtaining the sum 8, given that the red dice resulted in a number less than 4.
OR
Given that E and F are events such that P(E)=0.8, P(F)=0.7, P(E∩F)=0.6 Find P($\bar{E}|\bar{F}$).
28. Find the image of point (1, 0, 0) on the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$.

Section IV (Three marks questions)

29. Differentiate $x^{\sin x} + (\sin x)^{\cos x}$ with respect to x.
OR
If x = a sec t, y= b tan t find $\frac{d^2y}{dx^2}$ at t= $\frac{\pi}{6}$.

30. Find the intervals in which the function f given by $f(x)=(x+1)^3(x-3)^3$ is strictly increasing or decreasing.
31. Evaluate $\int_0^{\pi} \frac{x\sin x}{1+\cos^2 x} dx$
32. Find the area of the region bounded by the curves $x^2+y^2=4$, $y=\sqrt{3}\,x$ and x axis in the first quadrant.
OR
Find the area of the curve $9x^2+y^2=36$ using integration.
33. Solve $\frac{dy}{dx} = \frac{y}{x} - \cot\frac{y}{x}.\cos\frac{y}{x}$
34. The scalar product of the vector $\hat{i}+\hat{j}+\hat{k}$ with a unit vector along the sum of vectors $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is equal to one. Find the value of λ.
35. Integrate the function $\frac{x+2}{\sqrt{x^2+2x+3}}$

Section V(Five marks questions)

36. Use the product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations $x - y + 2z = 1,\ 2y - 3z = 1 \ and\ 3x - 2y + 4z = 2$

OR

If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$, find A^{-1} and hence solve the system of linear equations $x+2y+z=4$, $-x + y + z=0$ and $x-3y+z=2$.
37. Find the maximum and minimum values of $5x + 2y$ subject to constraints $2x + 3y \geq 6,\ x - 3y \leq 3,\ 3x + 4y \leq 24,\ x \geq 0 \ and\ y \geq 0.$
38. Find the equation of a line passing through the point (2,1,3) and perpendicular to the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x}{-3} = \frac{y}{2} = \frac{z}{5}$.

OR

Find the equation of the plane passing through the point (0, 1, 0) and (3, 4, 1) and parallel to the line $\frac{x+3}{2} = \frac{y-3}{2} = \frac{z-2}{5}$.