

- A. All **Questions** are compulsory. Study, Assignments, Solved Previous Year Papers . Questions and Answers. Free Forever.
- B. This Question Paper contains 29 Questions.
- C. Questions 1-4 in Section A are Very Short -Answer type Questions carrying 1 Mark each.
- D. Questions 5-12 in Section B are Short Answer type Questions carrying 2 Marks each.
- E. Questions 13-23 in Section C are Long Answer-I type Questions carrying 4 Marks each.
- F. Questions 24-29 in Section D are Long Answer-II type Questions carrying 6 Marks each.

Section A

1

Let A be the set of all students of a boys school. Show that the relation R in A given by $R = \{(a, b) : a \text{ is sister of b}\}\$ is the empty relation and $R' = \{(a, b) : \text{ the difference between heights of a and b is less than 3 meters}\}\$ is the universal relation.

[1]

2

Evaluates:

3

If P_1 , P_2 , P_3 , P_4 are points in a plane or space and O, the origin of vectors, show that P_4 coincides with

O if an only if

$$[1\overrightarrow{QP_1} + \overrightarrow{P_1P_2} + \overrightarrow{P_2P_3} + \overrightarrow{P_3P_4} = \vec{0}.$$

4

Show that the function $f: N \to N$ given by f(x) = 2x, is one-one but not onto.

[1]

Section B

5

Using principle value, evaluate the following :

$$[2d]os^{-1}\left(cos\frac{2\pi}{3}\right) + sin^{-1}\left(sin\frac{2\pi}{3}\right).$$

6



[2]

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7

Examine whether the function f given by $f(x) = x^2$ is continuous at x = 0.

[2]

8

The cost function C(x), in rupees, of producing x items (x \geq 15) in a certain factory is given by C(x) = 20 + 10x² + $\frac{15}{x}$. Determine the marginal cost function and the marginal cost of producing 100 items.

[2]

9

Evaluate the following integral:

$$[2]$$
 $\int_{0}^{4} \frac{dx}{\sqrt{x^2 + 2x + 3}}$

10

Determine the order and degree of the differential equation:

$$\left[2\left[1 + \left(\frac{dy}{dx}\right)^{2}\right]^{\frac{3}{2}} = 5\frac{d^{2}y}{dx^{2}}$$

11

Find values of x for which $x(\hat{i} + \hat{j} + \hat{k})$ is a unit vector.

[2]

12

$$\hat{i} - \hat{j}$$
 and $\hat{j} - \hat{k}$.

Find the angle between the vector

[2]

Section C

13

Evaluate the determinant

$$\Delta = \begin{vmatrix} 1 & \sin \theta & 1 \\ -\sin & 1 & \sin \theta \end{vmatrix}, \text{ Also, prove that } 2 < A < 4.$$
OR
$$\begin{vmatrix} -1 & -\sin & 1 \\ -1 & -\sin & 1 \end{vmatrix}$$



 $\Delta = \begin{bmatrix} -\sin \theta & \cos \alpha & -\sin \theta \\ \cos \alpha & -\sin \theta \end{bmatrix}$, Solved Previous Year Papers. Questions and Answers. Free Forever.

Discuss continuity of the function f given by

$$f(x) = |x - 1| + |x - 2|$$
 at $x = 1$ and $x = 2$.

[4]

15

The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of an edge is 10 centimeters?

[4]

16

Show that the following differential equation is homogeneous and find a primitive of it. Derive the solution wherever possible:

$$[4x] y' - y + x \sin\left(\frac{y}{x}\right) = 0$$

OR

Solve
$$\left(x \sin \frac{y}{x}\right) dy = \left(y \sin \frac{y}{x} - x\right) dx$$
[4]

17

Find all the points of discontinuity of the function f defined by

$$f(x) = \begin{cases} x + 2, & \text{if } x < 1 \\ 0, & \text{if } x = 1 \\ x - 2, & \text{if } x > 1 \end{cases}$$

18

Evaluate
$$\int_0^{\frac{\pi}{2}} \frac{\sin x + \cos x}{\sqrt{\sin x \cos x}} dx.$$

19

If P, Q, R, S are the points (-2, 3, 4), (-4, 4, 6), (4, 3, 5), (0, 1, 2), prove by projection that PQ is perpendicular to RS.

[4]

OR



[4]

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20

A die is thrown three times. Events A and B are defined as below:

A: 4 on the third throw

B: 6 on the first and 5 on the second throw

Find the probability of A given that B has already occurred.

[4]

21

A point source of light along a straight road is at a height of 'a' metres. A boy 'b' metres in height is walking along the road. How fast is his shadow increasing if he is walking away from the light at the rate of c metres per minute?

[4]

22

ABCDEF is a regular hexagon. Show that

(i)
$$\overrightarrow{AB} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AE} + \overrightarrow{AF} = 3 \overrightarrow{AD}$$

(ii)
$$\overrightarrow{AB} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AE} + \overrightarrow{AF} = 6 \overrightarrow{AO}$$

where O is centre of the hexagon.

[4]

23

An unbiased die is thrown twice. Let the event A be 'odd number on the first throw' and B the event 'odd number on the second throw'. Check the independence of the events A and B.

[4]

Section D

24

Show that each of the relation R in the set $A = \{x \in Z : 0 \le x \le 12 \}$, given by

(i)
$$R = \{(a, b) : | a - b | \text{ is a multiple of 4 } \}$$

(ii) $R = \{(a, b) : a = b\}$ is an equivalence relation. Find the set of all elements related to 1 in each case.

[6]



Mathematics Pre Board Paper 2

a-b Study, Assignments, Solved Previous Year Papers . Questions and Answers. Free Forever.

Evaluate:

$$[6]_0^{\frac{\pi}{2}} \frac{dx}{a \cos x + b \sin x}$$
. a, b > 0

27

Find the area of the region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$.

[6]

OR

Draw a graph of $\frac{x^2}{9} + \frac{y^2}{25} = 1$ and evaluate area bounded by it. [6]

28

A (-1, 2, -3), B (5, 0, -6), C (0, 4, -1) are three points. Show that the direction cosines of the

bisectors of are proportional to 25, 8, 5 and -11, $AB = \sqrt{(5+1)^2 + (0-2)^2 + (-6+3)^2}$

[6]
$$= \sqrt{36 + 4 + 9} = \sqrt{49} = 7$$

$$AC = \sqrt{(0 + 1)^2 + (4 - 2)^2 + (-1 + 3)^2}$$

OR

For the cartesian and vector equation of a line which passes through the point (1, 2, 3) and is parallel to the line $\frac{-x-2}{1} = \frac{y+3}{7} = \frac{2z-6}{3}$.

[6]

29

Solve the following linear programming problem graphically:

Maximise Z = 4x + y

subject to the constraints: $x + y \le 50$, $3x + y \le 90$, $x \ge 0$, $y \ge 0$

[6]