



PURE MATHEMATICS

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS = 100

- NOTE: (i)** Attempt FIVE questions in all by selecting TWO Questions each from SECTION-A&B and ONE Question from SECTION-C. ALL questions carry EQUAL marks.
- (ii)** All the parts (if any) of each Question must be attempted at one place instead of at different places.
- (iii)** Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
- (iv)** No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- (v)** Extra attempt of any question or any part of the attempted question will not be considered.
- (vi)** Use of Calculator is allowed.

SECTION-A

- Q. 1. (a)** Find centre of S_3 . (10)
- (b)** Using the row operations, show that the matrix $\begin{pmatrix} 1 & 2 & -3 \\ 1 & -2 & 1 \\ 5 & -2 & -3 \end{pmatrix}$ has no inverse. (10) (20)
- Q. 2. (a)** For any group G , show that $\frac{G}{\{e\}} \cong G$ and $\frac{G}{G} \cong \{e\}$. (10)
- (b)** Suppose U and W are distinct four dimensional subspaces of a vector space V of dimension six. Find the possible dimension of $U \cap W$. (10) (20)
- Q. 3. (a)** For what value of α is the matrix $\begin{pmatrix} \alpha & \alpha-1 & \alpha+1 \\ 1 & 2 & 3 \\ 2-\alpha & \alpha+3 & \alpha+7 \end{pmatrix}$ is singular? (10)
- (b)** Define $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ by $T(x_1, x_2, x_3) = (-x_3, x_1, x_1 + x_3)$. Find $N(T)$. Is T one-to-one? (10) (20)

SECTION-B

- Q. 4. (a)** Find the value of θ and the limit in order that $\lim_{x \rightarrow 0} \frac{\sin 2x + \theta \sin x}{x^3}$ be finite. (10)
- (b)** Show that $x < \sin^{-1} x < \frac{x}{\sqrt{1-x^2}}$, $0 < x < 1$. (10) (20)
- Q. 5. (a)** Given that $U = \frac{1}{x^2 + y^2 + z^2}$. Verify that $U_{xx} + U_{yy} + U_{zz} = 0$. (10)
- (b)** Evaluate $\iint (x^2 + y^2) dx dy$, over the domain bounded by $y = x^2$ and $x = y^2$. (10) (20)
- Q. 6. (a)** Evaluate $\iint (x^2 + y^2) dx dy$, over the region bounded by $xy=1$, $y=0$, $y=x$ and $x=2$. (10)
- (b)** Find an equation of a normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ in the form $ax \cos \theta + by \cot \theta = a^2 + b^2$. Prove that the normal is external bisector of the angle between the focal distances of its foot. (10) (20)

Pure Mathematics Past Paper

Actuarial Society of America



Pure Mathematics Past Paper:

Pure Mathematics Past Paper Book Review: Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has been apparent than ever. Its power to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**Pure Mathematics Past Paper**," compiled by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound affect our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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