



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

RS Peters



Pure Mathematics Past Paper:

The Top Books of the Year Pure Mathematics Past Paper The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous captivating novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the engaging narratives that have charmed audiences this year. Pure Mathematics Past Paper : Colleen Hoover "It Ends with Us" This poignant tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover masterfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can triumph. Pure Mathematics Past Paper : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This spellbinding historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens crafts a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Pape, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and suspenseful novel that will keep you speculating until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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