STI semin) (Stomed | Choice Based Paper / Subject Code: 40101 / Applied Mathematics-IV

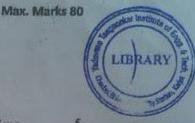
Duration: 3 hours

N. B.: 1. Question No. 1 is Compulsory.

2. Attempt any 3 Questions from Question no. 2 to 6.

3. Figures to the right indicate the full Marks.

4. Statistical tables are allowed.



- Que. 1 If λ is an eigen value of square matrix A then prove that λ^n is an eigen 5 value of matrix A"
 - Let X be a continuous random variable with probability density function f(x)=kx(1-x), $0 \le x \le 1$. Find k and determine the number 'b' such that $P(X \le b) = P(X \ge b)$
 - Find a basis for the orthogonal complement of the subspace in \mathbb{R}^3 spanned by the vectors $V_1 = (1, -1, 3)$, $V_2 = (5, -4, -4)$, $V_3 = (7, -6, 2)$ 5
 - d Evaluate $\int_{-2}^{2} \frac{2z+3}{z} dz$ along the upper half of the circle |z|=25
- a If A= $\begin{bmatrix} 2 & 3 & 4 \\ 0 & 4 & 2 \\ 0 & 0 & 3 \end{bmatrix}$ find eigen values and eigen vectors of A²-2A+I. 6
 - In a precision bombing attach there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. 6 How many bombs must be dropped to give a 99% chance or better of completely destroying the target.
 - Find all Taylor and Laurent series expansions for $f(z) = \frac{z}{(z-2)(z-3)}$ about 8 z=1 indicating the region of convergence.
- Three factories A, B, and C produces 35%, 45% and 20% of the total Que.3. production of an item. Out of their production 90%, 50%, and 10% are defective. Find probability that it is produced by factory A
 - Verify Cayley-Hamilton theorem for A= 0 1 0 and hence find A-1 b
 - Obtain the equations of the lines of regression for the following data. Also obtain the estimate of X for Y=70.

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

TURN OVER

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a By using Cauchy's residue theorem, evaluate $\int \frac{\sin \pi z + \cos \pi z}{(z-1)(z-2)} dz$ where C is |z|=3Construct an orthonormal basis of R3 using Gram Schmidt process to S={(3, 0, 4), (-1, 0, 7), (2, 9, 11)} Determine whether the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ is diagonalizable, if yes diagonalise it. Show that the matrix $A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$ is derogatory and find the Que, 5 a 6 minimal polynomial of the matrix The weekly wages of 1000 workmen are normally distributed around a mean of Rs 70 and standard deviation Rs 5. Estimate the number of workers whose weekly wages will be (i) between 65 and 75 (ii) more than 75 C Find the curve y = f(x) for which $\int_{1}^{x} y \sqrt{1+y^2} dx$ is minimum subject to the constraint $\int_{1}^{x} \sqrt{1+y^{2}} dx = 1$. Que.6. a If $A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ show that $A^{100} = \begin{bmatrix} -299 & -300 \\ 300 & 301 \end{bmatrix}$ 6 Between 2 pm and 4 pm, the average number of phone calls per minute coming into a switchboard of a company is 2.5. Find the probability that during one particular minute there will be (i) no phone call at all, (ii) at least 5 calls. By using Cauchy residue theorem, evaluate 1. $\int \frac{dx}{x^2+9}$ 11. $\int \frac{1}{5+4\cos\theta} d\theta$