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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May - 2016
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, AME, MIE, PTE, CEE, MSNT)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Define an Unitary matrix. [2]

b) Find the Eigen values of the matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$ [3]

c) If $f(x) = x^3 - 3x^2 + 2$ in [2, 4], then find the value of C of Lagranges mean value theorem. [2]

d) State Rolle's mean value theorem. [3]

e) Evaluate $\int_{x=0}^{1} \int_{y=0}^{2} y^2 dy dx$. [2]

f) Evaluate $\int_{0}^{\infty} x^{1/2} e^{-x/5} dx$ in terms of Gamma functions. [3]

g) State Newtons Law of cooling. [2]

h) Find the solution of the differential equation is $(D^2 + 4)y = 0$. [3]

i) Find $L[te^t]$. [2]

j) Find $L^{-1}\left(\dfrac{1}{s^3}\right)$. [3]

PART-B

(50 Marks)

2.a) Prove that the Eigen values of a skew-Hermitian matrix are zero or purely imaginary.

b) If A and B are square symmetric matrices of same order then prove that
   i) AB + BA is symmetric
   ii) AB−BA is Skew symmetric. [5+5]

OR

3. Using Cayley Hamilton theorem find the inverse of the matrix
$\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$ [10]

4. Find the maximum and minimum values of $x^3 y^2 (1-x-y)$. [10]

OR

5 If $x=uw,\ y=\dfrac{u}{v}$. Verify that $\dfrac{\partial(x,y)}{\partial(u,v)}\cdot\dfrac{\partial(u,v)}{\partial(x,y)}=1.$ [10]

6.a) Evaluate $\displaystyle\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2)\,dx\,dy$.

b) Evaluate $\displaystyle\int_0^1 \dfrac{x^4 dx}{\sqrt{(1-x^2)}}$. [5+5]

OR

7. By changing the order of integration evaluate $\displaystyle\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$. [10]

8.a) If a population is increasing exponentially at the rate of 2% per year. What will be the percentage increase over a period of 10 years?

b) Solve the differential equation $(D^2 - 5D + 6)y = e^x \, Sinx.$ [5+5]

OR

9. Solve $(D^2 + 1)y = x\sin x$ by the method of variation of parameters. [10]

10.a) Find L [t cost].

b) Find the inverse Laplace transform of $\dfrac{s-5}{(s^2 + 3s + 2)}$. [5+5]

OR

11. Solve the differential equation $\dfrac{d^2 x}{dt^2} - \dfrac{4dx}{dt} - 12x = e^{3t}, x(0) = 1, x'(0) = -2$ using Laplace transforms. [10]

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