R09

Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, December - 2018
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, BME, IT)

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

Answer any five questions
All questions carry equal marks
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1.a) Find the values of λ and μ such that the equations $x+y+z=6,\ x+2y+3z=10,\ x+2y+\lambda z=\mu$ have i) no solution ii) unique solution and iii) an infinite number of solutions.

b) Solve the system of equations $x+y+z+w=0,\ x+y+z-w=4,\ \ x+y-z+w=-4,$ $x-y+z+w=2$ by Gauss elimination method. [8+7]

2.a) Find the Eigen values and the corresponding Eigen vectors of $A=\begin{pmatrix}1 & 2 & 3\\ 0 & 2 & 5\\ 0 & 0 & 1\end{pmatrix}$.

b) Using Cayley-Hamilton theorem, find A^{-1} and A^{-2} if $A=\begin{pmatrix}4 & 6 & 6\\ 1 & 3 & 2\\ -1 & -4 & -3\end{pmatrix}$. [7+8]

3.a) If $A=\begin{pmatrix}0 & 1+2i\\ -1+2i & 0\end{pmatrix}$, show that the matrix $(I-A)\,(I+A)^{-1}$ is Unitary.

b) Reduce the quadratic form $Q=x^2+3y^2+3z^2-2yz$ to canonical form. [5+10]

4.a) Derive the Newton-Raphson iterative formula to find the square root of a positive Number N and hence find the square root of 10.

b) Using Newton's forward and backward interpolation formulae, find the values of $y(5)$ and $y(9)$ for the following data: [7+8]

x:	4	6	8	10
y:	1	3	8	16

5.a) Fit a second degree curve of the form $y=ax^2+bx+c$ for the following data:

x:	0	1	2	3	4
y:	1	1.8	1.3	2.5	6.3

b) Apply Simpson's $\frac{3}{8}$ rule to evaluate $\int_0^1 \frac{dx}{1+x^2}$ with $h=\frac{1}{9}$. [8+7]

6. Using Runge-Kutta methods of order 2 and order 4, find an approximate value of $y(0.2)$ for $y' = x + y^2,\ y(0) = 1$ with $h = 0.1$. [15]

7.a) Find the Fourier series expansion of $f(x) = x^2$ in $(-\pi, \pi)$ and hence deduce that

i) $1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + ... = \frac{\pi^2}{6}$ ii) $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ... = \frac{\pi^2}{12}$

b) Obtain the half-range Fourier sine series of $f(x) = e^x, 0 < x < \pi$. [9+6]

8.a) Find a partial differential equation by eliminating the arbitrary constants a and b from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.

b) Solve $x(y-z)p + y(z-x)q = z(x-y)$.

c) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial y} = 0$ by the method of separation of variables. [4+5+6]

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