

Code No: G2201/R13

M. Tech. I Semester Supplementary Examinations, December-2016

APPLIED MATHEMATICS

(Common to TE, SE and SD)

Time: 3 hours

Max. Marks: 60

Answer any FIVE Questions
All Questions Carry Equal Marks

1. Solve the heat equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(x,0)=0$, $u(0,t)=0$ and $u(1,t)=t$ with $h=0.25$ and $k=1/16$. Compute $u(0.75, 0.125)$ using Crank Nicolson method. 12

2. a If $u(r, \theta, \phi)$ depends only on r and θ , then find the Laplacian in spherical coordinates. 5
 b Derive the finite difference approximations of the first and second derivatives, 7

3. a Fit a curve of the form $y = ab^x$ for the following data 6

x	1	3	7	9	10	12	15
Y	0	2	6	8	13	14	20

- b Calculate the coefficient of correlation between age of cars and annual maintenance cost. Comment on your result. 6

Age of cars	2	4	6	7	8	10	12
Cost	1600	1500	1700	1900	2200	2300	2000

4. a Find the multiple linear regression equations of X on Y and Z using the data given below: 7

X	1	2	5	7	11
Y	3	6	7	8	12
Z	5	7	9	11	14

- b Following are the ranks obtained by 9 students in History and economics. Find the rank correlation coefficient and comment. 5

History	1	2	3	4	5	6	7	8	9
Economics	3	5	2	1	6	8	9	4	7

5. Derive the solution of Laplace equation in spherical coordinates treating the solution to be symmetric about z-axis. 12

6. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $0 < x < 10$, $u(0,t)=0$, $u(10,t)=0$ and $u(x,0)=x$ using analytical method. 12

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7. a Investigate the values of β and μ so that the equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$ and $2x + 3y + \beta z = \mu$ have
- no solution
 - a unique solution
 - An infinite number of solutions.
- b Find, using Gauss elimination method, the inverse of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$.
8. Find the eigenvalues and eigen vectors of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.