Code No: 54018 **R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech II Year II Semester Examinations, May - 2016**
**NUMERICAL METHODS**
**(Common to ME, MCT, MIE)**

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

**Answer any five questions**
**All questions carry equal marks**
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1.a) Use the false position method to find a root of the function $f(x) = x^2 - x - 2 = 0$ in the Range $1<x<3$.

b) Using Newton Raphson method, find the root of the equation $x + \log_{10} x = 3.375$. Correct to four significant figures. [7+8]

2. Solve the system of equations

$3x_1 - 6x_2 + 2x_3 = 15$

$4x_1 - x_2 + x_3 = 2$

$x_1 - 3x_2 + 7x_3 = 22$

Gauss Seidel method. [15]

3.a) The pressure P of wind corresponding to Velocity V is given by the following data. Estimate P when V=25.

| V | 10 | 20 | 30 | 40 |
|---|---|---|---|---|
| P | 1.1 | 2 | 4.4 | 7.9 |

b) Given the data points.

| i | 0 | 1 | 2 |
|---|---|---|---|
| $x_i$ | 4 | 9 | 16 |
| $f_i$ | 2 | 3 | 4 |

estimate the function value 'f' at x=7 using cubic splines. [7+8]

4.a) Fit a straight line to the following data:

| Year x | 1941 | 1951 | 1961 | 1971 | 1981 |
|---|---|---|---|---|---|
| Production y (in thousand tons) | 8 | 10 | 12 | 10 | 16 |

and find the expected production in 1986.

b) Fit a curve of the form $y = ae^{bx}$ to the data [7+8]

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 1.7 | 1.8 | 2.3 | 3.2 |

5.a) Find $y'(0)$ and $y''(0)$ from the following data at x = 0.

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y | 4 | 8 | 15 | 7 | 6 | 2 |

b) Evaluate $\int_0^4 e^x dx$ by Simpson's rule and compute it with the actual value. [7+8]

6. Using Adams-Bashforth formula, determine y(0.4) given the differential equation $\frac{dy}{dx} = \frac{1}{2}xy$ and y(0)=1. Find the initial value by Taylor's series method. [15]

7. Solve the boundary value problem $x''(t) = 2\left(-x'(t)\right) - 2x(t)$ *with* $x(0) = 0,\ x(1) = 1$, taking h = 0.5. [15]

8. Find the values of u(x,t). Satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ and the boundary condition u(0,t) = 0 = u(8,t) and $u(x,0) = 4x - \frac{1}{2}x^2$ at the points. x=i, i=0,1,2……8 and $t=\frac{1}{8}$ j; j=0,1,2,3,4,5. [15]

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