**Code No: 56083** **R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech III Year II Semester Examinations, April - 2018**
**NUMERICAL METHODS**
**(Automobile Engineering)**

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

**Answer any five questions**
**All questions carry equal marks**
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1.a) Using Newton Raphson method find the fifth root of 3 correct up to three decimal places.

b) i) write the regula falsi method formula.
ii) Interpret Regula Falsi Method geometrically. [7+8]

2.a) Solve the following equations by Gauss Seidel iteration r method
$x - 4y + z = 5$, $5x + y - z = 2$, $2x + 5y + z = 7$

b) Solve the following equations by Gauss-Jordan method
$2x + 5y + 7z = 52$; $2x + y - z = 0$; $x + y + z = 9$ [8+7]

3.a) For the following data estimate f(1.720), f(2.68) and f(2.36) using appropriate difference formulae.

| x | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|---|
| y | 0.0495 | 0.0605 | 0.0739 | 0.0903 | 0.1102 | 0.1346 | 0.1644 | 0.2009 |

b) Given that f(20) = 24 , f(24) = 32, f(28)=35, f(32) = 40 , find f(25) using Newton's forward interpolation formula. [8+7]

4.a) Derive normal equations to fit a second degree polynomial.

b) Fit a curve of the form $y = ab^x$ to the following data [8+7]

| x | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| y | 144 | 172.8 | 207.4 | 248.8 | 298.5 |

5.a) A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given in the table below. Using Simpson's 1/3 rd rule, find the velocity of the rocket at t = 80 seconds.

| t(sec) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|---|
| f(cm/sec$^2$) | 30 | 31.63 | 33.34 | 35.47 | 37.75 | 40.33 | 43.25 | 46.69 | 50.67 |

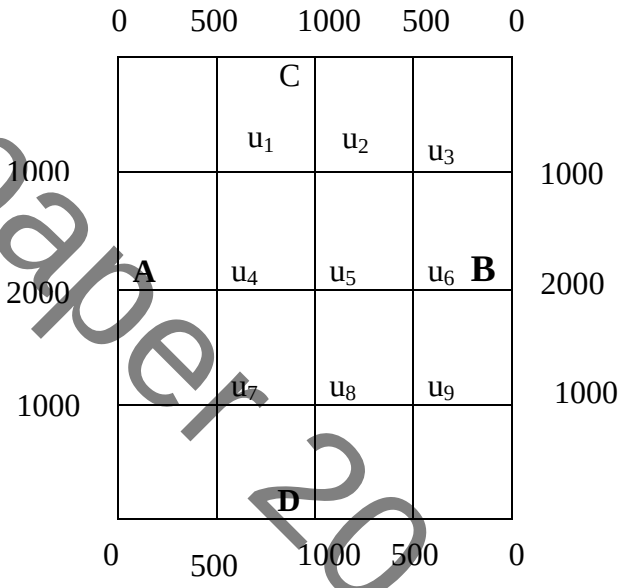
b) Evaluate $\int_4^{5.2} \log x dx$ taking h =0.2 using Trapezoidal rule and Simpson's 3/8$^{th}$ rule.[7+8]

6. Evaluate y (1.1), y (1.2) using Runge-Kutta method of order four for the Initial value problem. $\frac{dy}{dx} = x^2 + y^2$, y (1) = 0 with h = 0.1. [15]

7. Solve the boundary value problem,

$\frac{d^4y}{dx^4} + 81y = 729x^2, y(0) = y'(0) = y''(1) = y'''(1) = 0$. Use n = 3. [15]

8. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in the following figure. [15]

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