Total No of Questions: [6] *SEAT NO. :*

[Total No. of Pages :2]

In-Sem Examination T.E. 2015 (Production)

Numerical Techniques and Optimization Methods

(Semester - II)

Time: 1 Hour ***Max. Marks : 30***

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume Suitable data if necessary***

Q1) **a)** Explain with suitable example (i) Truncation error (ii) Conversion error **[4]**

b) The concentration of pollutant bacteria C in the lake decreases with time according to: **[6]**

$C = 75e^{-1.5t} + 20e^{-0.075t}$

Use Bisection method to determine the time required to reduce the bacteria concentration to 15. Range of initial guess is 3 to 6.(Perform four iterations)

OR

Q2) **a)** The following system of equation was generated by applying mesh current law to an electrical circuit. Using Gauss Seidel method, determine I_1, I_2, I_3 **[8]**

$60I_1 - 40I_2 = 200$

$-40I_1 + 150I_2 - 100I_3 = 0$

$-100I_2 + 130I_3 = 230$

b) What is condition number? What is its significance? **[2]**

Q3) The stress τ and the shear strain rate $\dot{\gamma}$ for a pseudo-plastic fluid can be expressed as: **[10]**

$\tau = \mu\dot{\gamma}^n$.Where, μ is the viscosity and n is exponent of shear strain rate. Using following data for 0.5% hydroxethylcellulose in water solution, determine, μ and n.

$\dot{\gamma}$(1/s)	50	70	90	110	130
τ $(N/m^2$	6.01	7.48	8.59	9.19	10.21

OR

Q4) Data for specific volume '*v*' and entropy '*s*' for superheated H_2O at 200 MPa is given in Table below: **[10]**

v (m^3/Kg)	0.103	0.111	0.125
s (KJ/Kg K)	0.414	0.545	0.766

Determine entropy at specific volume of 0.108 m^3/kg using Lagrange interpolation method.

Q5) a) The outflow of a chemical concentration (c)from a reactor is measured as: **[10]**

t (sec)	0	1	4	6	8
c (mg/m^3)	12	22	32	45	58

For an outflow of 0.3 m^3/s, estimate the mass of chemical in grams that exit the reactor from 0 to 8 sec. The mass is given as:$M = Q\int_{t1}^{t2} c.dt$. Use Simpson's 1/3 rule.

OR

Q6) a) Explain trapezoidal rule for numerical integration. **[5]**

b) Explain Runge-Kutta methods for solving ordinary differential equation. **[5]**