SL-308

Seat No.	

Total No. of Pages : 4

S.E. (Mechanical Engineering) (Semester-IV) Examination, April - 2017
APPLIED NUMERICAL METHODS
Sub. Code : 63360

Day and Date : Tuesday, 25-04-2017 **Total Marks : 100**
Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Make suitable assumptions/data if required and state clearly.**
3) **Draw neat sketches wherever necessary.**
4) **Figures to the right indicate full marks.**
5) **Use of calculator is allowed.**

Q1) a) Solve any two **[2×5=10]**

i) Solve for a positive root of x-cosx=0 by Regula Falsi method.

ii) Using Newton Raphson method find the root between 0 and 1 of $x^3=6x-4$.

iii) Explain approximate error with an example.

b) Perform two iterations of the Newton Raphson method to solve the system of equations

$x^2+xy=10$; $y+3xy^2=57$

Take initial approximations as $x_0=1.8$, $y_0=3.1$. **[10]**

Q2) Solve any three **3×5=15]**

a) The currents i_1, i_2, i_3, and i_4 in an electric network satisfy the system of linear equation

$3i_1+2i_3-i_4=60$

$2i_1-i_2+4i_3=160$

$4i_2+i_3-2i_4=20$

$5i_1-i_2-2i_3+i_4=0$

Using Gauss Jordan method, find i_1, i_2, i_3, and i_4.

P.T.O.

b) Solve the following equations by Gauss-Seidal method.

$83x+11y-4z=95$

$3x+8y+29z=71$

$7x+52y+13z=104$

c) Solve the system of equations using LU Decomposition.

$5x-2y+z=4$

$7x+y-5z=8$

$3x+7y+4z=10$

d) Solve the system of equations using Gauss Elimination method

$x+2y+z=3$

$2x+3y+3z=10$

$3x-y+2z=13$

Q3) Solve any three. **[3×5=15]**

a) From the table given below, find the best values of 'a' and 'b' for curve $y=ae^{bx}$ by the method of least squares.

x:	1	2	3	4
y:	1.65	2.7	4.5	7.35

b) Using Lagrange's formula of interpolation find y(9.5).

x:	7	8	9	10
y:	3	1	1	9

c) Findf(x) as a polynomial in x and hence f(0) for the following data by Newton's divided difference formula.

x:	–1	1	2	3
f(x):	–21	15	12	3

d) Define Independent, repeated, Bernoulli trials and hence explain binomial distribution with an example.

Q4) Solve any three. **[3×5=15]**

a) Given the data below, find the isothermal work done on the gas as it is compressed from 23 litres to 3 litres. $W=\int_{v1}^{v2}$ pdv using Simpsons 1/3rd Rule.

V (lit):	3	8	13	18	23
P (atm):	12.5	3.5	1.8	1.4	1.2

b) Use Romberg's method to evaluate $\int_0^2$ (dx/(x*x+4)) take h=1.0,0.5,and 0.25.

c) Evaluate $\int_0^{\pi/2}$ (sinx)dx by two point Gaussian Quadrature formula.

d) The table given below reveals the velocity 'v' of a body during the time 't'. Find its acceleration at t=1.1.

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

Q5) Solve any three. **[3×5=15]**

a) Using modified Eulers method find y at x=1.5 if $y'=2y/x$ Given y(1)=2 take h=0.25

b) Find the eigen values and corresponding eigen vectors of

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$ by both power method

c) Given the boundary value problem $\frac{d^2y}{dx^2}=ex^2$; y(0)=2, y(1)=5 obtain its solution in the range $0 \le x \le 1$ with h=0.25 using finite difference method.

d) Solve $\frac{dy}{dx}=y-x^2$; given y(0)=1 by picard;s method. Obtain the values of y(0.1), y(0.2).

Q6) a) Classify the following partial differential equations: **[5]**

i) $U_{XX}+4U_{XY}+4U_{YY}=0$

ii) $x^2U_{xx}+(1-y^2)U_{yy}=0;x>0,y>0$

iii) $y^2U_{XX}+U_{yy}=0$

b) Explain implicit method with a neat sketch. **[5]**

c) Solve $U_{XX}+U_{yy}=0$ in the square region as shown in fig.1 by Liebmann's method. Take $\Delta x=\Delta y$. Perform three iterations of Gauss Seidal method. **[10]**