SJ-320

Total No. of Pages :4

Seat No.	

S.E. (Mechanical Engineering) (Semester - IV)
Examination, November - 2016
APPLIED NUMERICAL METHODS
Sub. Code : 63360

Day and Date :Monday, 07-11-2016 **Total Marks : 100**

Time : 2.30 p.m. to 5.30 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) If the length of a bridge and a rivet measured by you are 9999 cm and 9 cm respectively, while the true values are 10000 cm and 10 cm respectively, compute

i) the true error and

ii) true percent relative error for each case. **[5]**

b) Solve any two **[2×5=10]**

i) Use the method of false position, to find the fourth root of 32 correct to three decimal places.

ii) Using Muller's method find the root of equation

$1+2x-\tan x=0$ (Take $x_1=1, x_2=1.2, x_3=1.4$)

iii) Find the real root of $xe^x - 2 = 0$ using Newton Raphson method.

Q2) a) Solve the system of equations using LU Decomposition method. **[5]**

$$7x+2y-5z=-18$$
$$x+5y-3z=-40$$
$$2x-y-9z=-26$$

P.T.O.

d) State addition and Multiplication law of probability.

e) Compute the standard deviation of 100 students.

Mass in Kg	60-62	63-65	66-68	69-71	72-74
No.of students	5	18	42	27	8

Q4) 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 1/3rd rule, find the velocity of the rocket at t= 80 seconds. **[4]**

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) Solve any two

i) Evaluate $\int_{0.2}^{1.5} e^{-x^2}\,dx$ using the 3- point Gaussian Quadrature. **[6]**

ii) Evaluate the integral $\int_{1}^{2} \log_e x.\,dx$ using Romberg's method, given that,**[6]**

x	4	4.2	4.4	4.6	4.8	5	5.2
y	1.3863	1.4351	1.4816	1.526	1.5686	1.6094	1.6486

iii) The distance travelled by a point P in X-Y plane in a mechanism is as shown in the table below. Estimate the distance travelled, velocity and acceleration of point P when $x = 4.5$ **[6]**

x (mm)	1	2	3	4	5
y (mm)	14	30	62	116	198

Q5) a) Apply Runge Kutta method to find approximate value of y for $x = 1.2$, 1.4 if $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}$ given $x_0 = 1, y_0 = 0$. **[6]**

b) Solve any two

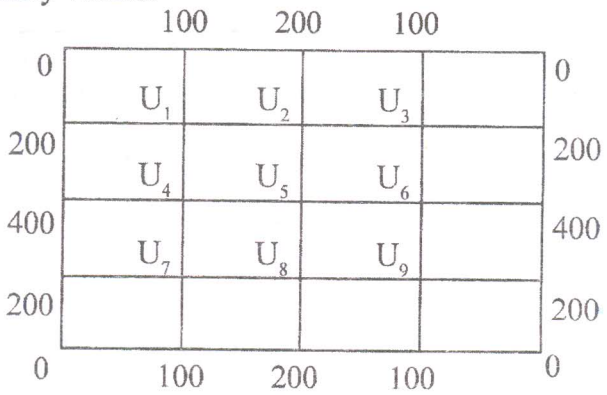
i) Use Euler's method to solve $dy/dx = 2 + \sqrt{xy}$, $y(1) = 1$. Find $y(1.2)$ by taking 5 steps. **[5]**

ii) Find an approximate value of y when $x = 0.1$, if $dy/dx = x - y^2$ and $y = 1$ at $x = 0$ using Picard's method. **[5]**

iii) Find the largest Eigen value and the associated Eigen vector. **[5]**

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$ by power method.

Q6) a) Solve the equation $u_{xx} + u_{yy} = 0$ for the following square mesh with shown boundary values. **[10]**



b) Solve any two

i) Classify the following partial differential equations **[4]**

1) $y^2 . u_{xx} + u_{yy} + u_x^2 + u_y^2 + 7 = 0$

2) $f_{xx} + 2f_{xy} + f_{yy} = 0$

ii) Explain Crank Nicolson method. **[4]**

iii) Use explicit method to solve for the temperature distribution of a long thin rod with a length of 10 cm and following values $\Delta x = 2$ cm, $\Delta t = 0.1$ second and $\lambda = 0.0203$ at time t = 0.1 second, 0.2 second. At t = 0 the temperature of rod is zero and the boundary condition are fixed for all times at T (0) = 100° C and T (10) = 50°C. **[4]**