COLLEGE OF ENGINEERING, PUNE

END SEMESTER EXAM

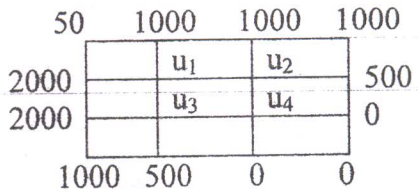
Subject: Numerical Methods and Computer Programming

Year and branch **TY (Mechanical)** **Academic Year 2013-14**

1. All questions are compulsory
2. Figures to the right indicate full marks
3. Use of non-programmable calculator is permitted

Q 1 a) Solve the partial differential equation using Liebmann's method for **10**

$$\nabla^2 u = 0$$



Solve upto 8 iterations

Q 1 b) Solve the system of ordinary differential equation using Runge kutta 4th order method. **8**

$$\frac{dx}{dt} = y - t$$

$$\frac{dy}{dt} = x + t$$

with x=1, y=1 at t=0, $\Delta t = h = 0.1$

Find x(0.1) and z(0.1)

OR

Q 1 b) Using Taylors series expansion find y(0.1) correct to four decimal places. **8**

$y' = x - y^2$ for $y(0) = 1$

Q 2 a) Solve using Lagrange's Interpolation Method. **10**

x	0	1	2
y	4	3	6

Also find y at x=1.5 $\left.\frac{dy}{dx}\right|_x = 0.5$ and $\int_0^3 y\,dx$

Q 2 b) The speed of train which starts from rest is given by the following table, the time being recorded in minutes from the start and the speed in kilometres per hour. Obtain distance travelled using Simpson's 1/3 rd Rule. **8**

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

OR

Q 2 b) Solve using Weedle's method. **8**

$$\int_0^{\pi} \frac{\sin^2\theta}{5+4\cos\theta} d\theta$$

Q3 a) Write a flow chart for Gauss Elimination method. **6**

Q3 b) Attempt **any three** of the following **18**

i a) An approximate value of π is given by X_1=22/7 =3.1428571 and its true value is X= 3.1415926. Find absolute and relative errors.

b) Three approximate values of number 1/3 are given as 0.30, 0.33 and 0.34. Which of these is best approximation?

ii Obtain solution of $e^x - cosx$ using secant method correct up to 4 decimal places.

iii Solve the system of equations using Gauss Seidel method correct up to three decimal places

$$30x - 2y + 3z = 75; 2x + 2y + 18z = 30; x + 17y - 2z = 72$$

iv Fit the curve of degree one using least square technique from the given data points

X	2.5	3.5	5	6	7.5	10	12.5	15	17.5	20
y	13	11	8.5	8.2	7	6.2	5.2	4.8	4.6	4.3