Total No. of Questions : 12]

SEAT No. :

P2255

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T.E. (Mechanical and Automobile Engineering)
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Course) (Semester-I) (302045)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Draw Flow chart for 'Modified Newton Raphson's' Method. **[8]**

b) Apply the Simpson's 1/3rd rule to evaluate the integral, $I = \int_{0.5}^{0.7} \sqrt{x} e^x dx$. **[8]**

OR

Q2) a) Draw Flow chart for 'Gauss Quadrature 3 Point Formula'. **[8]**

b) Apply Newton Raphson Method to determine the root of equation $f(x) = \cos x - xe^x = 0$ to an accuracy of 0.0001, take $x1 = 0.3$. **[8]**

Q3) a) Draw flowchart for 'Newton's Forward Difference' Interpolation. **[8]**

b) Determine y' and y'' at $x = 0$ for following data **[8]**

x	0	1	2	3	4
y	2	5	10	22	34

OR

Q4) a) Explain Interpolation, Inverse Interpolation and Extrapolation. **[6]**

b) Find $f(9)$ using Lagrange's Interpolation **[10]**

x	5	7	11	13	17
F(x)	150	392	1452	2366	5202

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Q5) a) Explain partial pivoting with example. **[6]**

b) Solve following set of equations using Gauss Elimination Method. **[12]**

$3X + 6Y + Z = 16$

$2X + 4Y + 3Z = 13$

$X + 3Y + 2Z = 9$

OR

Q6) a) Draw Flow Chart for finding values of unknown variables by Back Substitution in Gauss - Elimination method, when the coefficient matrix is available in upper triangular format. **[6]**

b) Using Gauss Siedel method, solve the following set of simultaneous equations up to two decimal place accuracy. Do Partial Pivoting. **[12]**

$5X + Y - Z = 4.7$

$X + 8Y + 2Z = 15.7$

$2X + 3Y + 10Z = 27.1$

SECTION-II

Q7) a) Explain the following with suitable example **[6]**

i) Significant Digit.

ii) Inherent Error.

iii) Rounding Error.

iv) Truncation Error.

b) Fit a straight line through following set of points **[10]**

x	10	15	20	25	30
y	0.750	0.935	1.100	1.200	1.300

OR

Q8) a) Explain Least Square Method and derive equation to fit a straight line through a set of points. **[4]**

b) Draw flow chart to fit an equation $y = ax^b$ using Least Square Method. **[4]**

c) The value of u is given by equation, $u = 3v^7 - 6v$. Find the absolute error, relative error and percentage error in u at $v = 1$ if the error in $v = 0.05$. **[8]**

Q9) a) Draw flow chart to solve Ordinary differential equations using Euler's method. **[8]**

b) Given $\frac{dy}{dx} = 3x + \frac{y}{2}$. With initial condition as $y(0) = 1$, find $y(1)$ with step size of 0.5. Use RungeKutta 4th order method. **[8]**

OR

Q10)a) Draw flow chart to solve simultaneous first order differential equations using RK4 method. **[8]**

b) Solve the equation $\frac{dy}{dx} = \frac{(y + xy)}{x}$. Given the initial condition $y(1) = 2.718$, find $y(1.2)$ taking step size of 0.1 and accuracy of 0.001 using Modified Euler's formula. **[8]**

Q11)a) Draw flow chart to solve Parabolic Equation by Explicit Method. **[8]**

b) Solve the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10(x^2 + y^2 + 10)$ over the square with $x = y = 0$ and $x = y = 3$, with $u = 0$ on the boundary and mesh length 1. **[10]**

OR

Q12)a) Draw flow chart to solve Laplace Equation. **[8]**

b) Evaluate the pivotal values of the following equation taking $h = 1$ and upto one half of the period of vibration,

$$16\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$$

Given that $u(0, t) = u(5, t) = 0$; $u(x, 0) = x^2 (5 - x)$ and $\frac{\partial u}{\partial t}(x, 0) = 0$. **[10]**

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