B.TECH. SEM -V PRODUCTION 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT : NUMERICAL METHODS

Day **Saturday** Time **02.30 PM TO 05.30 PM**

Date **20/01/2018** Max. Marks : 60

W-2017-2166

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 **a)** What are the errors and its types? Explain how these are reduced in relation with numerical methods. **[05]**

b) Explain with example the different types of significant digits. **[05]**

OR

a) What are floating point numbers? Explain various arithmetic operations with floating point numbers. **[05]**

b) A civil engineer has measured the height of 10 floor building as 2950 cm and the working height of each beam as 35 cm while the true values are 2945 cm and 30 cm respectively. Compare the absolute and relative error. **[05]**

Q.2 **a)** Use bisection method to find the root of $f(x) = e^{-x} - x$ upto 3 decimal places. **[05]**

b) Derive an equation for Newton Raphson method and explain its graphical interpretation. **[05]**

OR

a) Explain graphically the method of false position. **[05]**

b) Find a real root of the equation $x^3 - 2x - 5 = 0$ to an accuracy of 4 decimal places by secant method. **[05]**

Q.3 Solve the following system of equations by Gauss Elimination method: **[10]**

$$x_1 - 2x_2 + 3x_3 + 9x_4 = 5$$
$$3x_1 + 10x_2 + 4x_3 + 2x_4 = 7$$
$$11x_1 + 5x_2 + 9x_3 + 2x_4 = 13$$
$$2x_1 + 3x_2 + 7x_3 + 6x_4 = 11$$

OR

a) Use Gauss-Jordan method and solve the system of equations. **[05]**

$$x_1 + x_2 + x_3 = 4$$
$$4x_1 + 3x_2 - x_3 = 12$$
$$3x_1 + 5x_2 + 3x_3 = 15$$

b) Solve the following equation by Gauss-Seidel procedure. The answer should be correct to three significant digits. **[05]**

$$x_1 + 10x_2 + 4x_3 = 6$$
$$2x_1 - 4x_2 + 10x_3 = -15$$
$$9x_1 + 2x_2 + 4x_3 = 20$$

P.T.O.

Q.4 **a)** $Y = x^3$ is given for x = 1, 2, ...5. Use Lagrange's formula to obtain x at y = 3.375. Compare this result with correct value, 1.5. **[05]**

b) Find the least squares approximation of second degree for the discrete data given below: **[05]**

x_i	-2	-1	0	1	2
$Y_i = f(x_i)$	15	1	1	3	19

OR

a) Using Newton's divided differences interpolation find f(2). Given that **[05]**

x	1	4	5	6
y	0	1.3863	1.6094	1.7917

b) Derive the equations for fitting the given data by multiple regression. **[05]**

Q.5 **a)** Calculate the value of h such that the integral $\int_0^1 x\, e^x dx$ using simpson's $\frac{1}{3}$ rule is correct upto three significant digits after decimal point. **[05]**

b) Find f' (0.6) and f'' (0.6) from the following table. Use central difference formula. **[05]**

x	0.4	0.5	0.6	0.7	0.8
f(x)_	1.5836	1.7974	2.0442	2.3275	2.6510

OR

a) Evaluate the integral $\int_0^{\pi} (4 + 2\sin x)\, dx$ using simpsons $\frac{3}{8}$ rule where n = 5. Compute percent relative error. **[05]**

b) Discuss Newton's forward difference method and write an algorithm for the same. Find first derivative of f(x) at x = 0.5 if **[05]**

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)_	3.375	7.000	13.625	24.000	38.875	59.000

Q.6 **a)** Explain in brief algorithm for Euler's method. **[05]**

Solve: $\frac{dy}{dx} = y - \frac{2x}{y}$

$y(0) = 1$ in the range $0 \le x \le 0.2$ using Euler's method, take h = 0.1.

b) Given : $y' = x^2 - y$ **[05]**

$y(0) = 1$

Find y (0.1), y (0.2) using Runge-Kutta 2nd and 3rd order methods.
Take h = 0.1.

OR

a) Explain in brief following with an algorithm: **[05]**

i) Euler's method

ii) Improved Euler's method

b) Using Runge-Kutta method of fourth order to solve the following differential equation in the interval [0, 0.4] **[05]**

$\frac{dy}{dx} = \frac{y+x}{y-x}$ $y = 1$ at $x = 0$ and $h = 0.2$.

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