B.TECH. SEM -V PRODUCTION 2014 COURSE (CBCS) :
SUMMER - 2018
SUBJECT : NUMERICAL METHODS

Day : **Friday** Time : **10.00 AM TO 01.00 PM**
Date : **25/05/2018** **S-2018-2374** Max. Marks : 60

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

b) Suppose that you have a task of measuring the lengths of a bridge and a rivet and come up with 9999 and 9 cm respectively. If the true values are 10,000 and 10 cm respectively, compute: **[05]**
i) the error **ii)** the percentage relative error in each case.

OR

a) What are the various types of errors? **[05]**

b) Explain various arithmetic operations with floating point number. **[05]**

Q.2 **a)** Find the root of $f(x) = 2x - \log_{10} x - 7 = 0$, which should be correct upto 3 decimal places by false position method. **[05]**

b) Find the smallest positive root of equation, $\tan x = x$, correct to '3' decimal places by Newton Raphson Method. **[05]**

OR

a) Derive an equation for secant method and show its graphical interpretation. **[05]**

b) Use bisection method to find a real root of equation $x^3 - x - 4 = 0$ correct up to 3 decimal places. **[05]**

Q.3 **a)** Solve the following system using Gauss Elimination Method: **[05]**

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

b) Solve the following equations by Gauss-Seidel Method: **[05]**

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

OR

a) Using LU decomoposition method, solve the following equations: **[05]**

$$12x_1 - 7x_2 + 3x_3 = 8$$
$$x_1 + 7x_2 - 4x_3 = -51$$
$$4x_1 - 4x_2 + 9x_3 = 62$$

b) Use Gauss-Jordan technique to solve the following system of equations: **[05]**

$$x + y + z = 4$$
$$4x + 3y - z = 12$$
$$3x + 5y + 3z = 15$$

P.T.O.

Q.4 **a)** If F is the pull required to lift a load W by means of a pulley block, fit a linear law of the form F = mW + c connecting F and W, using the data. **[05]**

W	50	70	100	120
F	12	15	21	25

Where F and W are in kg wt. Compute F when W = 150 kgwt.

b) Find the interpolating polynomial for the data: **[05]**

x	0	1	2	5
f(x)	2	3	12	147

OR

a) Obtain a regression plane by multiple linear regression to fit the data given below: **[05]**

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

b) Find the polynomial of degree three which takes the values as shown below: **[05]**

X	0	1	2	4
Y	1	1	2	5

Q.5 **a)** Evaluate $\int_0^6 \frac{dx}{1+x}$ by simpson's $\frac{1}{3}$ rule dividing into 10 sub intervals. **[05]**

b) Discuss method of central difference and draw an algorithm for the same. **[05]**

OR

a) Approximate the integral below using the trapezoidal rule and simpson's rule using 8 equal segments $\int_{-1}^{1} \frac{1}{1+x^2}\,dx$. **[05]**

b) Discuss method of Newton's forward difference and draw an algorithm for the same. **[05]**

Q.6 **a)** Using Euler's method, obtain the solution of $y' = x - y$, given $x_0 = 0$, $y_0 = 1$ $x = 0.6$ taking $h = 0.2$. **[05]**

b) Discuss in brief Runge Kutta's method of: **[05]**
i) 2nd order **ii)** 3rd order

OR

a) Explain in brief following with an algorithm: **[05]**
i) Euler's method
ii) Improved Euler's method

b) Solve the initial value problem using Runge Kutta 4th order method. **[05]**
$u' = -2tu^2$
$u(0) = 1$ with $h = 0.2$ on the interval $[0, 0.4]$.

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