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Total No. of Questions : 09

B.Tech.(Electronics & Computer Engg.) (2011 Onwards) (Sem.–4)

NUMERICAL METHODS

Subject Code : BTEL-401

M.Code : 62021

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION–A

1. Answer briefly :

a. Is the sequence $x_{n+1} = 0.5x_n$, $n \geq 0$, $x_0 = 1$ a convergent sequence?

b. Write the forward finite difference formula for $\frac{dy}{dx}$.

c. Define the row rank of a matrix.

d. Define a singular matrix and also give one example.

e. Write the formula for Simpson's 1/3 rule.

f. Can we use composite Simpson's rule with even number of node points?

g. Compute $\int_0^2 e^x dx$ using Trapezoidal rule.

h. Use the forward-difference formula to approximate the derivative of $f(x) = \ln x$ at $x_0 = 1.8$ using $h = 0.1$.

i. What is the order of convergence when Newton Raphson's method is applied to the equation $x^2 - 4x + 4 = 0$ to find its multiple root.

j. Explain complete pivoting.

SECTION-B

2. Use Newton's method to find a sequence converging to the root 0 of the equation $ln(x+1) - x = 0$ starting with an initial guess $x_0 = 1$.

3. Apply Taylor's method of order 2 with $N = 10$ to initial value problem :

$$y' = y - t^2 + 1,\ 0 \le t \le 2,\ y(0) = 0.5.$$

4. Find the order of convergence of Newton's method.

5. Solve the following system of equations

$$x_1 + 2x_2 - x_3 = 3$$

$$2x1 + x_2 + x_3 = 3$$

$$-3x_1 + x_2 + 2x_3 = 4$$

6. Approximate the integral $\int_0^{\pi/4} x \sin x dx$ using composite Simpsons rule with 5 nodes.

SECTION-C

7. Use R-K method of order 2 to find out $y(0.2)$ with $h = 0.1$ for the following initial value problem

$$y' = te^{3t} - 2y,\ 0 \le t \le 1,\ y(0) = 0.$$

8. Derive Secant's formula for solving the equation $f(x) = 0$ (specifying the assumptions made). Use the secant method to solve the equation x = cosπ starting with an initial guesses 0.5 and $\frac{\pi}{4}$.

9. Approximate $\int_0^2 e^{2x} \sin 3x dx$ employing:

   a. Gaussian 2 point formula.

   b. Gaussian 3 point formula.

   Also compute the errors in both the cases.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.