Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech (EEE) (Sem.–5)

NUMERICAL ANALYSIS

Subject Code : EE-311

Paper ID : [A0418]

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

Q1 Answer the following :

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

Q2 Apply Taylor's method of order 2 with TV = 10 to initial value problem

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

Q3 Use Newton's method to find a root of $x^3 + 4x^2 - 10 = 0$ in the interval [1,2],

Q4 Approximate the integral $\int_e^{e+1} \frac{1}{x \ln x} dx$ using composite trapezoidal rule.

Q5 Find the order of convergence of Secant's method.

Q6 Solve the following system of equations

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

$$2x_1 + x_2 = 3,$$

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

SECTION-C

Q7 Use R-K method of order 4 to find out $y(1.2)$ with $h = 0.1$ for the following initial value problem

$$y' = 1 + y/t, \quad 1 \le t \le 2, \quad y(1) = 2$$

Q8 Derive Newton Raphson's formula for solving the equation $f(x) = 0$ (specifying the assumptions made). Use the Newton Raphson method to solve the equation $x = \cos x$ starting with an initial guess $\frac{\pi}{4}$.

Q9 Determine the values of h that will ensure an approximation error of less than 0.00002 when approximating $\int_0^{\pi} \sin x dx$ and employing

a) Composite trapezoidal rule.

b) Composite Simpson's rule.