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# B.Tech.(Electronics \& Computer Engg.) (2011 Onwards) (Sem.-4) NUMERICAL METHODS <br> Subject Code: BTEL-401 <br> 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 $x_{n+1}=0.5 x_{\mathrm{n}}, n \geq 0, x_{0}=1$ a convergent sequence?
b. Write the forward finite difference formula for $\frac{d y}{d x}$.
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 $\int_{0}^{2} e^{x} d x$ using Trapezoidal rule.
h. Use the forward-difference formula to approximate the derivative of $f(x)=\operatorname{In} x$ 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 $x^{2}-4 x+4=0$ 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 :

$$
\mathrm{y}^{\prime}=y-t^{2}+1,0 \leq \mathrm{t} \leq 2, y(0)=0.5 .
$$

4. Find the order of convergence of Newton's method.
5. Solve the following system of equations

$$
\begin{aligned}
& x_{1}+2 x_{2}-x_{3}=3 \\
& 2 x_{1}+x_{2}+x_{3}=3 \\
& -3 x_{1}+x_{2}+2 x_{3}=4
\end{aligned}
$$

6. Approximate the integral $\int_{0}^{\pi / 4} x \sin x d x$ 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

$$
y^{\prime}=t e^{3 t}-2 y, 0 \leq \mathrm{t} \leq 1, y(0)=0 .
$$

8. Derive Secant's formula for solving the èquation $f(x)=0$ (specifying the assumptions made). Use the secant method to solve the equation $\mathrm{x}=\cos \pi$ starting with an initial guesses 0.5 and $\frac{\pi}{4}$.
9. Approximate $\int_{0}^{2} e^{2 x} \sin 3 x d x$ 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.

