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B. Tech. (EE) (Semester-2nd)
MATHEMATICS-II (LINEAR ALGEBRA, TRANSFORM CALCULUS AND
NUMERICAL METHODS)
Subject Code: BMATH3-201
Paper ID: [18111509]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

a) Given $A = \begin{bmatrix} 3 & -5 \\ -1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 8 & 3 \end{bmatrix}$ find $A + B$.

b) Defined the symmetric matrix with example.

$$A = \begin{bmatrix} 3 & -1 \\ 4 & 3 \end{bmatrix}.$$

c) Find the determinant of the matrix

d) Write the Simpson's 1/3rd rule.

e) Write the Newton's Forward Difference formula.

f) Write the Runge-Kutta 4th order formula to solve the differential equation.

g) Write the two dimensional Laplace equation.

h) Write the one dimensional wave equation.

i) Find the Laplace transform of $3 + t^5$.

j) Find the inverse Laplace transform of $L^{-1} \left[\frac{1}{s^2 + 9} \right]$.

Section – B

(5 marks each)

Q2. If $A = \begin{bmatrix} 4 & -2 \\ 7 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 2 & -3 \end{bmatrix}$, then find the product of A and B.

Q3. Find the cube root of 12 using the Newton Raphson method assuming $x_0 = 2.5$.

Q4. Find the value of K_1 using Runge-Kutta method of 4th order if $\frac{dy}{dx} = 2x + 3y^2$ and $y(0.1) = 1.1165$, $h = 0.1$

Q5. Solve the $\frac{dy}{dx} - y = e^{3t}$, $y(0) = 2$ by using the Laplace transform.

- Q6. Find the eigen values of the matrix $A = \begin{bmatrix} 0 & -2 \\ 3 & 4 \end{bmatrix}$.

Section – C

(10 marks each)

- Q7. Evaluate $\int_0^1 e^x dx$, by Simpson's 1/3rd rule.

- Q8. Using the Crank-Nicholson method, solve the equation $u_{xx} = 16u_t$ subject to

$u(x, 0) = 0$, $u(0, t) = 0$, and $u(1, t) = 100t$, Compute 't' for one time step taking $h = \frac{1}{4}$.

- Q9. Let $A = \begin{bmatrix} x+y & y \\ 2x & x-y \end{bmatrix}$, $B = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$, $C = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$. If $AB=C$, then find the matrix A^2 .