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

Total No. of Questions : 09

B.Tech. (2011 Onwards) (Sem.–2)

ENGINEERING MATHEMATICS-II

Subject Code : BTAM-102

Paper ID : [A1111]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1. **Write briefly :**

(a) Determine for what values of a and b, the differential equation :

$(y + x^3)dx + (ax + by^3dy = 0)$ is exact ?

(b) Solve the differential equation : $y' + 4xy + xy^3 = 0$.

(c) Factorizing the differential operator, reducing it into first order equations, solve the differential equation : $y'' - 4y' - 5y = 0$.

(d) Find the general solution of the equation : $4y'' - 4y' + y = e^{\frac{x}{2}}$.

(e) On putting $x = e^z$, find the transformed differential equation of

$x^2y'' + xy' + y = x$.

(f) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$ and find its inverse.

(g) Define orthogonal and unitary matrices with suitable examples.

(h) State different forms of comparison test.

(i) Prove that the series : $1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+.............$ is convergent but not absolutely convergent.

(j) Prove that $w = \cos z$ is not a bounded function.

SECTION-B

2. Solve the differential equation : $(5x^3 + 12x^2 + 6y^2)dx + 6xydy = 0$.

3. Find the general solution of the equation : $y'' + 16y = 32\sec 2x$, using the method of variation of parameters.

4. Solve : $(1+x)^2 \dfrac{d^2y}{dx^2} + (1+x)\dfrac{dy}{dx} + y = 4\cos\log(1+x)$.

5. An inductance of 2 Heneries and a resistance of 20 Ohms are connected in series with e.m.f. E volts. If the current is zero when t = 0, find the current at the end of 0.01 *second* if E=100 volts.

SECTION-C

6. Using Gauss-Jordan method, find the inverse of the matrix, $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 3 & 3 \\ 0 & 1 & 2 \end{bmatrix}$.

7. (i) Find the eigen-values and the corresponding eigen-vectors of the matrix

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}.$$

(ii) Does the series : $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n^{\frac{3}{2}}}$ converge? Justify.

8. Examine the convergence or divergence of the following series :

(i) $\displaystyle\sum_{n=1}^{\infty} \frac{n+1}{n}$, (ii) $\displaystyle\sum_{n=1}^{\infty} \frac{4^n n!n!}{(2n)!}$, (iii) $\displaystyle\sum_{n=0}^{\infty} \frac{n^2}{2^n}$, (iv) $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1}\frac{1}{n^2}$,

9. (i) Find all values of which satisfy, $e^z = 1 + i$.

(ii) Find real and imaginary parts of $\mathrm{Log}[(1 + i)\mathrm{Log}\, i]$.

(iii) If $\tan(x + iy) = i$, where x and y are real, prove that x is indeterminate and y is infinite.