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**

INSTRUCTIONS 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. Check whether the given equation is exact and obtain the general solution $(1 + x^2)dy + 2xy\,dx = 0$.

b. Solve the differential equation $(x-a)\frac{dy}{dx} + 3y = 12(x-a)^3, x > a > 0$.

c. Find the solution of the differential equation $y''+2y'+2y = 0$.

d. Find a differential equation of the form $ay''+by'+cy = 0$, for which e^{-x} and xe^{-x} are solutions.

e. Solve the differential equation $y''''+32y''+256y = 0$.

f. Determine whether the set {(3, 2, 4), (1, 0, 2), (1,–1,–1)} of vectors is linearly independent.

g. Find the eigen values and corresponding eigen vectors for $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$.

h. Discuss the convergence of the harmonic series $\sum_{n=1}^{\infty} \frac{1}{n}$.

i. Express $\sin^8\theta$ in a series of cosines of multiples of θ.

j. Express Log (Log i) in the form of $a + ib$.

SECTION-B

2. i) Find the integrating factor and hence solve $(5x^3 + 12x^2 + 6y^2)dx + 6xy\,dy = 0$

   ii) Solve the differential equation $\frac{dy}{dx} - y = y^2(\sin x + \cos x)$.

3. i) Find a homogeneous linear differential equation with real coefficients of lowest order which has the $xe^{-x} + e^{2x}$ as the particular solution.

   ii) Using differential operator, find general solution of $(D^2 + 9)y = x\,e^{2x}\cos x$.

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

5. i) Find the general solution of the equation $x^2y'' + 5xy' - 5y = 24x\ln x$.

   ii) A particle is executing simple harmonic motion with amplitude 20cm and time 4 seconds. Find the time required by the particle in passing between points which are at distances 15cm and 5cm from the centre of force and are on the same side of it.

SECTION-C

6. i) Using Gauss-Jordan method, find the inverse of the matrix $\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$

   ii) Determine the system $x + y + z = 3$, $3x - 9y + 2z = -4$, $5x - 3y + 4z = 6$ is consistent and find the solution, if the system is consistent.

7. i) State and Prove Cayley Hamilton Theorem.

   ii) Discuss the convergence of the series $\sum\left[\frac{\sqrt{n+1}-\sqrt{n}}{n^p}\right], p > 0$.

8. i) Discuss the convergence of the series $\sum\left[\frac{x^{n+1}}{(n+1)\sqrt{n}}\right]$.

   ii) Discuss the convergence of the series $\sum\frac{(-1)^{n-1}n}{5n+1}$.

9. i) Prove that $\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = \cos\left(\frac{n\pi}{2}-n\theta\right)+i\sin\left(\frac{n\pi}{2}-n\theta\right)$.

   ii) Sum the series $\sin\alpha - \frac{\sin(\alpha+2\beta)}{2!} + \frac{\sin(\alpha+4\beta)}{4!} - .....\infty$