Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (2011 to 2017) (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. a) Solve the differential equation: $ydx - xdy = y^2x^3dx$

   b) Solve the differential equation $\frac{dy}{dx} + y = x^3y^6$

   c) Solve the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$

   d) Write down the general Cauchy's homogeneous equation and explain the transformation to solve this differential equation.

   e) A particle is executing simple harmonic motion with amplitude 5 meters and time period 4 seconds. Find the time required by the particle in passing between points which are at distances 4 and 2 meters from the centre of force and are on the same side of it.

   f) Find the rank of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 5 & 1 & 0 \\ -1 & 1 & -3 \end{bmatrix}$

   g) Define Hermitian matrix.

   h) Discuss the convergence of a geometric series.

   i) What is meant by conditionally convergent series? Give example,

   j) Find real and imaginary parts of coshz.

SECTION-B

Q2. a) Solve the Differential equation by finding an integrating factor:

$$(y^2 + x^2 + 2x)dx + 2ydy = 0$$

b) Solve the differential equation : $y = 2px + y^2p^3$, where p = $\frac{dy}{dx}$

Q3. a) Solve the differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x sinx$

b) Solve by using variation of parameter method: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = e^x tanx$

Q4. If an e.m.f Esinωt is applied to a circuit containing a resistance R , an inductance L and a condenser of Capacity C. The charge on the condenser at time t satisfies the equation $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = Esin\omega t.$

If R = $2\sqrt{LC}$, solve the differential equation for q.

Q5. Solve the following system of equations :

$$\frac{d^2x}{dt^2} - 3x - 4y = 0$$

$$\frac{d^2y}{dt^2} + x + y = 0$$

SECTION-C

Q6. a) For what values of λ and μ do the system of equations :

2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+ λz= μ have

(i) no solution

(ii) unique solution

(iii) infinite many solutions

b) Find the eigen values and eigen vectors of the following matrix : $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

Q7. a) Discuss the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{1}{n^p}, p > 0$

b) For what values of x does the following series converge $\sum_{n=1}^{\infty} \frac{x^n}{n}$

Q8. a) solve the equation $(1 + x)^n = (1 - x)^n$, n is any positive integer.

b) If x + iy = cosh(u + iv) then show that $\frac{x^2}{\cosh^2 u} + \frac{y^2}{\sinh^2 v}$

Q9. Find the sum of the trigonometric series

$$\sin\alpha + x\sin(\alpha + \beta) + \frac{1}{2.1} x^2 \sin(\alpha + 2\beta) + \cdots \infty$$