Exam.Code:0906
Sub. Code: 6201

1048

B.E., Second Semester

AS-201: Engineering Mathematics – II

(May – 2014 Common)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of programmable calculator is allowed.*

x-x-x

PART A

1. Solve the following differential equations: (3+3+4)

   (a) $x\,dy = (y + x^2 + 9y^2)dx$

   (b) $(1+x^2)dy + 2xy\,dx = cot(x)\,dx$

   (c) $(D^6 - 2D^3 + 1)y = e^{2x}$ where $D \equiv \frac{d}{dx}$

2. (a) Find the general solution of the differential equation: (5)

$$(D^2 + 1)y = x^2e^{2x} + \cos(2x)$$

   (b) Solve the differential equation using Laplace transforms technique: (5)

$$(D^3 - 3D^2 + 3D - 1)y = t^2e^t,\ y(0) = 1,\ y'(0) = 0,\ y''(0) = -2$$

3. (a) State and prove convolution theorem for Laplace transform. (5)

   (b) Using the method of variation of parameters solve the following differential equation: (5)

$$(D^2 + 4D + 4)y = \frac{2e^{-2x}}{x^2}$$

4. (a) Evaluate the integral $\int_0^\infty \frac{e^{-t} - e^{-3t}}{t}\,dt$. (3)

   (b) Find the Laplace transform of $f(t) = e^{-4t}\int_0^t \frac{sin(3u)}{u}du$. (4)

   (c) Find the inverse Laplace transform of $\ln\frac{s+1}{s-1}$. (3)

PART B

5. (a) Find the general solution of the partial differential equation: (7)

$$(x - y)y^2p + (y - x)x^2q = (x^2 + y^2)z$$

   (b) Formulate the partial differential equation by eliminating the arbitrary function: (3)

$$f(x^2 + y^2 + z^2,\ z^2 - 2xy) = 0$$

P.T.O.

6. (a) Find the fourier series of the **periodic function** $f(x)$ with period $p = 2\pi$ defined below: (5)

$$f(x) = \begin{cases} \pi e^{-x} & \text{if } -\pi < x < 0 \\ \pi e^{x} & \text{if } 0 < x < \pi \end{cases}$$

(b) Prove that (5)

$$\int_0^\infty \frac{\sin(\pi w)\sin(xw)}{1-w^2}\,dw = \begin{cases} \pi \sin(x)/2 & \text{if } 0 \le x \le \pi \\ 0 & \text{if } x > \pi \end{cases}$$

7. **(a) Find the fourier sine transform** of $f(x) = e^{-\pi x}$. (6)

(b) Find the trigonometric polynomial approximation of degree $N = 2$ for the **function** $f(x) = x^2$ $(-\pi < x < \pi)$ for which the total square error with **respect to this function** is minimum on the interval $[-\pi, \pi]$ (4)

8. **Find the solution** of the one dimensional wave equation for an elastic string **of length** L **which** is fixed at the end points with initial deflection and initial **velocity as** $f(x)$ and $g(x)$ respectively. (10)

x-x-x