Total No. of Questions : 6 Total No. of Printed Pages : 5

2904

EC-182

B.E. II Sem. (CGPA) Civil Engineering Exam. 2012-13

ENGINEERING MATHEMATICS-II

Paper : CE-201

Time Allowed : Three Hours

Maximum Marks : 60

Note: Attempt all questions. All questions carry equal marks.

Q.1. i) Solution of the equation $y = px + p^3$ is _____

ii) P.I. of the differential equation

$$\frac{d^2y}{dx^2} + 6\frac{dy}{dx} = \frac{e^{3x} + e^{2x}}{2}$$ is _____

iii) y = x is a part of C.F. of the equation

$$\frac{d^2y}{dx^2} + p\frac{dy}{dx} + Qy = R$$ if

a) $1 + p + Q = 0$ b) $1 - p + Q = 0$

c) $2 + 2px + Qx^2 = 0$ d) $P + Qx = 0$

iv) L.T. of $f(t) = e^{6t} - e^{-2t}$ is _____

v) For the Fourier series, $f(x) = x$ for $0 < x < 2\pi$ then find the Fourier coefficient as?

Q.2. a) Solve $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$

b) Solve $p^2 + 2py \cot x = y^2$

OR

a) Solve $(3xy^2 - y^3)dx - (2x^2y - xy^2)dy = 0$

b) Solve $y = 2px + y^2p^3$

Q.3. a) Solve $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 2y = e^x + \cos x$

b) $\frac{d^2y}{dx^2} - 4y = x \sin hx$

OR

a) Solve $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 20y = (x+1)^2$

b) Solve the following simultaneous equations:

$$\frac{dx}{dt}+\frac{dy}{dt}+3x=sint \text{ and}$$

$$\frac{dx}{dt}+y-x=cost$$

Q.4. a) Solve the differential equation

$$x\frac{d^2y}{dx^2}+(x-2)\frac{dy}{dx}-2y=\frac{x^3}{x}$$

b) Solve in series

$$(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}+4y=0$$

OR

a) Express

$f(x)=x^4+2x^3+2x^2-x-3$ in terms of legendre's, polynomials.

b) Prove that

$$\frac{d}{dx}\left(J_n^2+J_{n+1}^2\right)=2\left(\frac{n}{x}J_n^2-\frac{n+1}{x}J_{n+1}^2\right)$$

Q.5. a) Evaluate the following:

i) $L^{-1}\left\{\frac{1}{s^4(s^2+1)}\right\}$

ii) $L^{-1}\left\{\frac{e^{-4s}}{(s-2)^4}\right\}$

b) Solve by L.T. method:

$$\left(D^3-3D^2+3D-1\right)y=t^2e^t$$

Given that $y(0)=1,\ y'(0)=0,\ y''(0)=-2$

OR

a) By convolution theorem, evaluate

$$L^{-1}\left\{\frac{s^2}{\left(s^2+a^2\right)\left(s^2+b^2\right)}\right\}$$

b) Evaluate

i) $L\left\{\int_a^t e^{-t}\cos t\,dt\right\}$

ii) $L\left\{t^3\cos 3t\right\}$

Q.6. a) Expand the function $f(x) = 2x - x^2$ in (0, 3) and hence deduce that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots = \frac{\pi^2}{12}$$

b) Expand $f(x) = \pi x - x^2, 0 < x < \pi$ in half-range cosine series.

OR

a) Obtain Fourier series for the function $f(x)$ defined by

$$f(x) = \begin{cases} 1 + 2x/\pi, & -\pi \le x \le 0 \\ 1 - 2x/\pi, & 0 \le x \le \pi \end{cases}$$

b) Develop $\sin\frac{\pi x}{l}$ in a half-range cosine series in the range $0 < x < l$

❖❖❖❖❖❖❖