Total No. of Questions : 6

Total No. of Printed Pages : 7

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EK-315

B.E. (IInd Sem.) CGPA Civil Engg., Exam. 2016

ENGG. MATHEMATICS - II

Paper -CE-201

Time Allowed : Three Hours

Maximum Marks : 60

Note : Attempt all questions. Each question carry equal marks.

Q.I Give the answers to the following questions :

(a) Write the degree of differential equations

$$\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3+5y=0$$

(b) Write complementary function of the differential equation :

$$(D^4+2D^3-3D^2)y=x^2$$

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(c) y = x is a part of complementary function of the differential equation

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

If

$$L\{f(t)\} = \overline{f}(s)$$

then

$$L\left\{\int_0^t f(x)dx\right\} \text{ is.....}$$

(e) Equation

$$P_{l'} + Q_q = R \text{ is called .....}$$

Q.II (a) Solve the equation

$$\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x \sec y$$

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(b) Solve the differential equation

$$y(1+xy)\,dx + x(1-xy)\,dy = 0$$

OR

(a) Solve

$$x^2\left(\frac{dy}{dx}\right)^2 + 3xy\left(\frac{dy}{dx}\right) + 2y^2 = 0$$

(b) Solve

$$y = 2px + p^2$$

Q.III (a) Solve

$$\frac{d^3y}{dx^3} + y = \cos 2x$$

(b) Solve the following simultaneous differential equations

$$\frac{dx}{dt} + 2x - 3y = t;$$

$$\frac{dy}{dt} - 3x + 2y = e^{2t}$$

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Or

(a) Solve

$$x^2\frac{d^2y}{dx^2}+5x\frac{dy}{dx}+4y=x\log x$$

(b) Solve

$$\frac{d^2y}{dx^2}-6\frac{dy}{dx}+13y=8e^{3x}\sin 4x+x^2$$

Q.IV (a) Solve the following equation by series method :

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

(b) Show that when n is a positive integer :

$$J_{-n}(x)=(-1)^nJ_n(x)$$

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(a) Solve the differential equation by removing first derivative :

$$\frac{d^2y}{dx^2} - 2\tan x \frac{dy}{dx} + 5y = e^x \sec x$$

(b) Prove that

$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}(x^2 - 1)^n$$

Q.V (a) Find the Laplace transform of

(i) $f(t) = \frac{1 - \cos 2t}{t}$

(ii) $f(t) = e^{2t} t$

(b) Solve

$$(D^3 - 3D^2 + 3D - 1)y = t^2 e^t,$$

given that

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

using Laplace transform.

OR

(a) Find the inverse L.T. of

(i) $\bar{f}(s) = \log \dfrac{s+1}{s+2}$

(ii) $\bar{f}(s) = \dfrac{1}{s(s^2+1)}$

(b) State the convolution theorem for Laplace transform and prove that

$$L^{-1}\left\{\bar{f}(s) \cdot \bar{g}(s)\right\} = \int_0^t F(x)\, G(t-x)\, dx$$

Q.VI (a) Find the fourier series expansion of $f(x)$ when

$$f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$$

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(b) Develop

$$\sin\left(\frac{\pi x}{l}\right)$$

in a half range cosine series in the range

$0 < x < \ell$

OR

(a) Solve the partial differential equation :

$$\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 5\frac{\partial^3 z}{\partial x \partial y^2} - 2\frac{\partial^3 z}{\partial y^3} = e^{2x+y}$$

(b) Solve

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$$

by the method of separation of variables where

$u(x,0) = 6e^{-3x}$.
