

Total No. of Questions : 6

Total No. of Printed Pages : 4

### EIS-177

B.E. (IInd Sem.) (CGPA) (Civil Engg.) Exam.-2015

### ENGINEERING MATHEMATICS-II

Paper : CE-201

Time Allowed : Three Hours

Maximum Marks : 60

**Note :** Attempt all questions.

Question No. I is compulsory.

Q.I Give the answer to the following questions—

(a) Find the integrating factor of the differential

$$\text{equation } (1+y^2) + (x - e^{-\tan^{-1}y}) \frac{dy}{dx} = 0$$

(b) Complementary function of  $(D^4 - 1)y = x^2$  is .....

(c) If  $y=x$  is a part of C.F. of the equation

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

(d) Inverse Laplace transform of  $\frac{S}{s^2 - a^2}$  is .....

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(2)

(e) The constant term in the Fourier series for the function  $f(x) = x^2$  in the interval  $(-\pi, \pi)$  is .....

Q.II (a) Solve—

$$(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0 \quad 149$$

(b) Solve—

$$y - x = x \frac{dy}{dx} + \left(\frac{dy}{dx}\right)^2 \quad 198$$

or

(a) Solve —

$$p = \tan\left(x - \frac{p}{1+p^2}\right) \quad 680$$

(b) Solve the differential equation—

$$\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x \sec y \quad 146$$

Q.III (a) Solve the differential equation —

$$\frac{d^2y}{dx^2} - 5 \frac{dy}{dx} + 6y = \sin 3x + 4e^{-2x}$$

(b) Solve—

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

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Contd. ....

(3)

or

(a) Solve—

$$(2+3x)^2 \frac{d^2 y}{dx^2} + 3(2+3x) \frac{dy}{dx} - 36y = 5x^2$$

(b) Solve the Simultaneous equations—

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

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

Q.IV (a) Solve—  $x \frac{d^2 y}{dx^2} - \frac{dy}{dx} - 4x^3 y = 8x^3 \sin x^2$

(b) Prove that—  $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$

or

(a) Apply the method of variation of parameters to

solve  $\frac{d^2 y}{dx^2} - 3 \frac{dy}{dx} + 2y = \frac{e^x}{1+e^x}$ .

(b) Solve in series—  $(2-x^2) \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 2y = 0$

Q.V (a) Find  $L\left\{\frac{e^{-at} - e^{-bt}}{t}\right\}$ .

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(4)

(b) Use Laplace transform method to solve—

$$\frac{d^2 x}{dt^2} - 2 \frac{dx}{dt} + x = e^t \text{ with } x=2, \frac{dx}{dt} = -1 \text{ at } t=0$$

or

(a) If  $f(t)$  be a periodic function with period  $T$  i.e.

$f(t) = f(t+nT)$ , then prove that

$$L\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t) dt.$$

(b) Find the inverse L.T. of—

(i)  $L^{-1}\left\{\frac{1}{s^2-6s+18}\right\}$  (ii)  $L^{-1}\left\{\log \frac{s+1}{s+2}\right\}$

Q.VI (a) Develop  $\sin\left(\frac{\pi x}{l}\right)$  in a half range cosine series

in the range  $0 < x < l$ .

(b) Solve the partial diff. equation—

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = 2 \sin x \cos 2y$$

or

(a) Find the Fourier series for the function

$$f(x) = x - x^2, -\pi \leq x \leq \pi$$

(b) Solve the p.d.e.  $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$ .

Copies 100

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