

Roll No.

Total No. of Questions : 5]

[Total No. of Printed Pages : 4]

**B.E. IIInd Semester (CGPA)
Examination, 2017**

EF-315

**CIVIL ENGG.
(Engg. Maths.-II)
Paper : CE-201**

Time : 3 Hours]

[Maximum Marks : 60]

Note :- Attempt all questions. Each question carries equal marks.

1. (a) Eliminate the constants from the equation $Y = e^x (A \cos x + B \sin x)$ and obtain the differential equation.
 (b) Define linear differential equations and solve :

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

Or

- (a) Solve :

$$(1 + 4xy + 2y^2)dx + (1 + 4xy + 2x^2)dy = 0$$

SS-315

(1)

Turn Over

- (b) Solve :

$$\underbrace{p^2 + 2py \cot x + y^2}_{} = 0$$

2. (a) Solve :

$$\frac{d^2y}{dx^2} - 2 \frac{dy}{dx} + y = xe^x \sin x$$

- (b) Solve the following simultaneous differential equation :

$$\frac{dx}{dt} + 4x + 3y = t$$

$$\frac{dy}{dt} + 2x + 5y = e^t$$

Or

- (a) Consider the equation :

$$(D^n + a_1 D^{n-1} + a_2 D^{n-2} + \dots + a_n)y = 0$$

Where all a_i 's are constants and its auxiliary equation is :

$$m^n + a_1 m^{n-1} + a_2 m^{n-2} + \dots + a_n = 0$$

Then find the complementary function :

- (i) When the roots of a. c. are real and distinct ?
 (ii) When two roots of a. c. are imaginary ?

SS-315

(0)

- (b) Solve the Cauchy's homogeneous linear equation :

$$x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10 \left(x + \frac{1}{x} \right)$$

3. (a) Solve :

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

(b) Solve :

$$\frac{d^2y}{dx^2} + 4y = \tan 2x$$

Or

(a) Solve in series the equation :

$$\frac{d^2y}{dx^2} + xy = 0$$

(b) Prove that :

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

4. (a) Find :

$$L \left\{ \frac{e^{-at} - e^{-bt}}{t} \right\}$$

Turn Over

- (b) Express the following function in terms of unit step functions and find its Laplace transform :

$$f(t) = \begin{cases} 8 & , t < 2 \\ 6 & , t > 2 \end{cases}$$

Or

(a) State and prove convolution theorem :

(b) Using Laplace transforms, find the solution of the initial value problem :

$$y'' - 4y' + 4y = 69 \sin 2t$$

$$y(0) = 0, y'(0) = 1$$

5. (a) Find the Fourier series expansion of the periodic function of period 2π :

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

Hence, find the sum of the series :

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

(b) Using the method of separation of variables, solve :

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

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

Or

(a) Express $f(x) = x$ as a half range cosine series in $0 < x < z$.

(b) Solve the following first order partial differential equation :

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