Roll No. ....

Total No. of Questions : 6]

[Total No. of Printed Pages : 7

B.E. IInd Semester (CGPA) Examination, 2017

EFS–315

CIVIL ENGG.

(Engg. Maths.-II)

Paper : CE-201

Time : 3 Hours] **[Maximum Marks : 60**

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

1. Give the answer to the following questions :

(a) If

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

then its integrating factor is ....

(b) Complementary function of the differential equation $(D^4 + 2D^2 + 1)y = x^2$ is ....

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

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

if ....

(d) Laplace transform of cosh at is ....

(e) Order and degree of the partial differential equation

$$\frac{\partial^2 z}{\partial x^2}+2xy\left(\frac{\partial z}{\partial x}\right)^2+\frac{\partial z}{\partial y} = 5$$

are ....

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

(b) Solve the following equation :

$$p^3 - 4xyp + 8y^2 = 0$$

Or

(a) Solve :

$$yp^2 + (x - y)p - x = 0$$

(b) Solve :

$$\frac{dy}{dx} + y \tan x = y^3 \sec x$$

3. (a) Solve :

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

(b) Solve :

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

Or

(a) Solve :

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

(b) Solve the following simultaneous differential equations :

$$\frac{dx}{dt} - y = e^{-t}$$

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

4. (a) Solve :

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

in series solution.

(b) To prove that :

$$J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$$

Or

(a) Solve :

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

given that $x + \frac{1}{x}$ is one known integral.

(b) Express $f(x) = 5x^4 + 10x^3 + 3x^2 - x - 7$ in terms of Legendre's polynomials.

5. (a) Find Laplace transform of :

(i) $f(t) = \dfrac{1-e^t}{t}$

(ii) $f(t) = t^2 \sin at$

(b) If $L^{-1}\{\bar{f}(s)\} = F(t)$ and $L^{-1}\{\bar{g}(s)\} = G(t)$ where $F(t)$ and $G(t)$ are functions of class A, then prove that :

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

Or

(a) Find inverse Laplace transform of :

(i) $\dfrac{1}{s^2(s^2+1)}$

(ii) $\bar{f}(s) = \dfrac{e^{-4s}}{(s-2)^4}$

(b) Solve the following differential equation by Laplace transform method :

$$(D^2 + 4D + 4)y = 4e^{-2t},$$

if $y = -1$, $Dy = 4$ at $t = 0$.

6. (a) Expand in a Fourier series the periodic function $f(x)$ with period $2l$ which on the interval $(-l, l)$ is given by the equation $f(x) = |x|$, that $f(x) = |x|$ means :

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

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

Or

(a) Solve by Charpit's method :

$$q = px + p^2$$

(b) Solve the p.d. equation :

$$(D^2 - 2DD' + D'^2)z = e^{x+2y} + x^3$$