AU – 2493

Third Semester B. E. (Civil Engg.) (CGS) Examination

ENGINEERING MATHEMATICS - III

3 CE 01

(USC – 10172)

P. Pages : 4

Time : Three Hours] [Max. Marks : 80

Note : (1) Answer **Three** questions from Section A and **Three** questions from Section B.
(2) Use of calculator, normal distribution table is permitted.
(3) Use pen of Blue ink/refill only for writing the answer book.

SECTION A

1. Solve the differential equations :

1. (a) $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{-2x}\sin 2x + 4x^2e^x$. 7

(b) $x^3\frac{d^3y}{dx^3} + x^2\frac{d^2y}{dx^2} - 2y = x + \frac{1}{x^3}$ 6

OR

2. Solve the following differential equations :

(a) $(D^2 + 13D + 36)y = e^{-4x} + \sinh x$. 7

(b) Solve by the method of variation of parameters.

$$\frac{d^2y}{dx^2} - y = e^{-x}\sin(e^{-x}) + \cos(e^{-x})$$ 6

3. (a) Find Laplace transform of $te^{3t}\sin 2t$. 4

(b) Evaluate $\int_0^\infty e^{-2t}\frac{\sinh t}{t}\,dt$ using L. T. 5

(c) Find inverse Laplace transform of

$$\frac{s+29}{(s+4)(s^2+9)}$$ 5

OR

4. (a) Find the Laplace transform of triangular wave function

$$f(t) = \frac{t}{a} : 0 < t < a$$

$$= \frac{1}{a}(2a - t) , a < t < 2a$$

and $f(t) = f(t + 2a)$. 4

(b) Use convolution theorem to find the inverse Laplace transform of

$$\frac{s^2}{(s^2 - a^2)^2}$$ 5

(c) Solve the differential equation, using L. T.

$$\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 13x = ze^{-t},$$

where $x = 0; \frac{dx}{dt} = -1$ when $t = 0$. 5

5. (a) Solve : $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y} + \frac{\partial z}{\partial x} \cdot \frac{\partial z}{\partial y} = 0$ 4

(b) Solve : $(y^2 + z^2 - x^2) P - 2xyq + 2xz = 0$ 4

(c) Solve : $(D^3 - 7DD'^2 - 6D'^3) z = \sin(x + 2y) + x^2y$. 5

OR

6. (a) Solve : $pxtany = q + 1$ 4

(b) Solve : $(z^2 - 2yz - y^2) p + (xy + xz) q = xy - xz$. 4

(c) Solve : $(D^2 - D'^2)z = \sin 2x \sin 3y$. 5

SECTION B

7. (a) Using Newton - Raphson method find the root of the equation

$$2\tan x = 5e^{-x}$$ 5

(b) Apply Gauss-Seidal method to solve the equations :

$$x + 7y - 3z = -22$$

$$5x - 2y + 3z = 18$$

$$2x - y + 6z = 22.$$ 8

OR

8. (a) Determine the roots of $x^4 + x^3 - 7x^2 - x + 5 = 0$. Which lie between 2 and 3 correct to three decimal places ? 5

(b) Solve $\frac{dy}{dx} = x + y$, with $x_0 = 0$, $y_0 = 1$ by modified Euler's method for $x = 0{\cdot}1$, by taking $h = 0{\cdot}05$. 8

9. (a) If $f(z) = u + iv$ is analytic function, find $f(z)$ if

$$u + v = e^x(\cos y + \sin y) + \frac{x-y}{x^2+y^2}.$$ 5

(b) If $f(z)$ is analytic function with constant modulus, show that $f(z)$ is constant. 4

(c) Show that the transformation $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ into the straight line $4u + 3 = 0$. 5

OR

10. (a) If $w = \phi + i\psi$ represents a complex potential for an electric field

$$\psi = x^2 - y^2 + \frac{x}{x^2+y^2}$$

determine the function ϕ. 5

(b) Find the bilinear transformation which maps the points $z = 1, i, -1$ on to the points $w = i, 0, -i$. 5

(c) Find 'p' such that the function $f(Z)$ expressed in polar co-ordinates as $f(z) = r^2\cos 2\theta + i\, r^2 \sin\phi\theta$ is analytic. 4

11. (a) Fit a second degree parabola to the given data by using the method of least squares.

x :	7·5	10·0	12·5	15·0	17·5	20·0	22·5
y :	1·9	4·5	10·1	12·6	27·8	40·8	56·9

7

(b) In certain factory producing cycle tyres, there is a small chance 1 in 500 tyres to be defective. The tyres are supplied in a lot of 10. Using Poisson distribution, calculate the approximate number of lots containing no-defective, one defective, two defective tyres respectively in a consignment of 10,000 lots. 6

OR

12. (a) Find the co-relation coefficient between x and y from given data :

x :	78	89	97	69	59	79	68	57
y :	125	137	156	112	107	138	123	108

7

(b) The probability that an entering student will graduate is 0.4. Determine the probability that out of five students

(i) none

(ii) one and

(iii) at least one will graduate. 6