

Printed Pages – 5

Roll No. :

320351(14)

B. E. (Third Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(Civil Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) from each question is compulsory and carry 2 marks. Attempt any two parts (b), (c) & (d) with carries 7 marks each.

Unit-I

1. (a) Write the Dirichlet's conditions for Fourier series. 2

(b) Expand the Fourier series for $f(x) = |\cos x|$

$-\pi \leq x \leq \pi$.

7

320351(14)

PTO

[2]

- (c) Find the Fourier series to represent the function given by

$$f(x) \equiv \begin{cases} x & 0 \leq x \leq \pi \\ 2\pi - x & \pi \leq x \leq 2\pi \end{cases}$$

Hence deduce that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots \infty = \frac{\pi^2}{8} \quad 7$$

- (d) The following values of y gives the displacement in inches of a certain machine part for the rotation x of flywheel. Expand y' in terms of Fourier series upto 2nd harmonic. 7

$$x : 0 \quad \pi/6 \quad 2\pi/6 \quad 3\pi/6 \quad 4\pi/6 \quad 5\pi/6$$

$$y : 0 \quad 9.2 \quad 14.4 \quad 17.8 \quad 17.3 \quad 11.7$$

Unit-II

2. (a) Write the statement of convolution theorem. 2
 (b) Evaluate by using Laplace transform 7

$$\int_0^{\infty} t^3 e^{-t} \sin t \, dt$$

320351(14)

[3]

- (c) Find $c^{-1} \left(\frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right)$ by using convolution theorem. 7

- (d) Solve the differential equation

$$\frac{d^2 x}{dt^2} + 2 \frac{dx}{dt} + 5x = e^{-t} \sin t$$

given $x(0) = 0, x'(0) = 1$, at $t = 0$. 7

Unit-III

3. (a) Form the partial differential equation by eliminating arbitrary function. 2

$$z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$$

- (b) Solve : 7

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

- (c) Solve : 7

$$(D^2 - DD' - 2D'^2)z = (y-1)e^x$$

320351(14)

PTO

[4]

(d) Using the method of separation of variables solve

$$\frac{\partial u}{\partial x} = \frac{2\partial u}{\partial t} + u, \text{ where } u(x, 0) = 6e^{-3x}. \quad 7$$

Unit-IV

4. (a) Find the analytic function whose real part is 2

$$\frac{\sin 2x}{(\cosh 2y - \cos 2x)}$$

(b) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though C - R equation are satisfied there it. 7

(c) Evaluate by using Cauchy's Integral formula

$$\int_C \frac{\log z}{(z-1)^3} dz, \text{ where } C: |z-1| = \frac{1}{2}. \quad 7$$

(d) Evaluate

$$\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$$

where C is the circle $|z| = 3$. 7

[5]

Unit-V

5. (a) Define briefly the discrete and continuous probability distribution function. 2

(b) The probability density $p(x)$ of a continuous random variable is given by

$$p(x) = y_0 e^{-|x|}, \quad -\infty < x < \infty$$

P.T. $y_0 = 1/2$. Find the mean and variance. 7

(c) Fit the Poisson distribution for the following data : 7

x :	0	1	2	3	4
f :	46	38	22	9	1

(d) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution

$$P(z = 0.5) = 0.19, \quad P(z = 1.4) = 0.42. \quad 7$$