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Roll No. ....

**322351(14)**

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

**(New Scheme)**

**(CSE Engg. Branch)**

**MATHEMATICS-III**

***Time Allowed : Three hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

***Note : Part (a) is compulsory in each question carrying 2 marks and answer any two parts from part (b), (c) and (d) carrying 7 marks each.***

1. (a) The formulae for finding the half range cosine series for the function  $f(x)$  in  $(0, 1)$  are ..... 2

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(b) Find the Fourier series for  $f(x)$  in the interval  $(-\pi, \pi)$ , where

$$f(x) = \begin{cases} -x+1 & \text{for } -\pi \leq x \leq 0 \\ x+1 & \text{for } 0 \leq x \leq \pi \end{cases}$$

and deduce the value of  $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$  7

(c) Find the half range sine series for the function

$$f(x) = x - x^2 \text{ in the interval } (0, 1). \quad 7$$

(d) Obtain the first three co-efficients in the Fourier cosine series for  $y$ , where  $y$  is given in the following table : 7

$x :$	0	1	2	3	4	5
$y :$	4	8	15	7	6	2

2. (a) Find 2

$$L^{-1} \left\{ \frac{1}{(s+4)^3} \right\} = \dots$$

(b) Find the Laplace transform of :

[ 3 ]

(i)  $\frac{1 - \cos 3t}{t}$  4

(ii)  $te^{-2t} \sin 3t$  3

(c) Using convolution theorem evaluate : 7

$$L^{-1} \left\{ \frac{1}{s^2(s+1)^2} \right\}$$

(d) Solve differential equation, by transform method 7

$$(D^2 - 3D + 2)y = 1 - e^{2t}, \quad y(0) = 1, \quad y'(0) = 0$$

3. (a) Write Residue theorem. 2

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

(c) Using Cauchy's integral formula 7

Evaluate

$$\int_C \frac{e^{2z}}{(z+1)^4} dz, \quad C : |z| = 2$$

[ 4 ]

- (d) Apply the calculus of residues to prove that 7

$$\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos \theta} d\theta = \frac{\pi}{6}$$

4. (a) From the partial differential equation form 2

$$Z = f(x^2 + y^2)$$

- (b) Solve : 7

$$p - q = \log(x + y)$$

- (c) Solve : 7

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

- (d) Using the method of separation of variables, solve

$$3 \frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial y} + 0, \quad u(x, 0) = 4e^{-x} \quad 7$$

5. (a) State and explain random variable. 2

- (b) If  $x$  is a contineous random variable with

[ 5 ]

- probability density function given by : 7

$$f(x) = kx \quad (0 \leq x < 2)$$

$$= 2k \quad (2 \leq x < 4)$$

$$= -kx + 6k \quad (4 \leq x < 6)$$

find  $k$  and mean value of  $x$ .

- (c) The probability that a pen manufactured by a company will be defective is  $1/10$ . If 12 such pens are manufactured, find the probability that : 7

(i) exactly two will be defective

(ii) at least two will be defective

(iii) none will be defective

- (d) Fit a poisson distribution to the set of observation. 7

x :	0	1	2	3	4
f :	122	60	15	2	1