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MATH211

Enrol. No. A230S220433

[ST]

END SEMESTER EXAMINATION : NOV.-DEC., 2021

**APPLIED MATHEMATICS - III**

Time : 3 Hrs.

Maximum Marks : 60

Note: Attempt questions from all sections as directed.

Use of Scientific calculator is allowed.

**SECTION - A (24 Marks)**

Attempt any four questions out of five.

Each question carries 06 marks.

1. Solve the partial differential equation  $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial y} = u$  by

the method of separation of variables subject to  
 $u(0,t) = 0 = u(\pi, t)$ .

2. Reduce the equation  $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = 0$  into canonical form.

P.T.O.

(950)

3. Find the Fourier transform of  $f(x)$  defined by

$$f(x) = \begin{cases} 1, & \text{if } |x| < a \\ 0, & \text{if } |x| > a \end{cases}$$

4. Form a partial differential equation by eliminating

arbitrary function  $f$  from  $z = f\left(\frac{xy}{z}\right)$ .

5. Obtain the half-range sine series for  $f(x) = \cos x$ ,  
 $0 \leq x \leq \pi$ .

**SECTION - B (20 Marks)**

*Attempt any two questions out of three.*

*Each question carries 10 marks.*

6. A tightly stretched string with fixed end points  $x = 0$  and  $x = l$  is initially at rest in its equilibrium position. If it is set vibrating by giving to each of its points a velocity  $\lambda x(l-x)$ , find the displacement function  $y(x, t)$  of the string.

(950)

7. (a) Find the Fourier series expansion of the periodic function of period  $2\pi$ , where

$$f(x) = \begin{cases} 0, & -\pi \leq x \leq 0 \\ x, & 0 \leq x \leq \pi \end{cases} \quad (5)$$

- (b) Solve  $(p^2+q^2)z^2 = x^2+y^2$ . (5)

8. Find the Fourier cosine transform of  $f(x) = \frac{e^{-ax}}{x}$  and hence find  $\left[ \frac{e^{-ax} - e^{-bx}}{x} \right]$  where  $a, b > 0$ .

**SECTION - C (16 Marks)**  
*(Compulsory)*

9. (a) The following table connects values of  $x$  and  $y$  for a statistical input :

|   |   |    |    |    |    |    |
|---|---|----|----|----|----|----|
| x | 0 | 1  | 2  | 3  | 4  | 5  |
| y | 9 | 18 | 24 | 28 | 26 | 20 |

Express  $y$  in Fourier series up to first harmonic.  
Also find amplitude of the first harmonic. (8)

P.T.O.

(950)

(b) Solve  $(D^2 - DD' + D' - 1)z = \cos(x + 2y) + e^y$ .

(8)