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MATH211 Enrol. No. A2305220433

[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.

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, $0 \le x \le \pi$.

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.

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

$$f(x)=\begin{cases}0, & -\pi\le x\le 0\\ x, & 0\le x\le \pi\end{cases}$$ (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.

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

(8)