given that :

$$x(0) = 1,\ x(\pi/2) = -1$$

Unit IV

7. (a) Find the Fourier transform of :

$$f(x) = \begin{cases} 1 - x^2, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$$

Hence evaluate :

$$\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2}\, dx$$

(b) Using Parseval's identity, prove that :

$$\int_0^\infty \frac{dt}{(a^2 + t^2)(b^2 + t^2)} = \frac{\pi}{2ab(a+b)}$$

8. (a) Find the z-transform of $n^2 e^{nq}$.

(b) Use convolution theorem to evaluate :

$$z^{-1}\left\{\frac{z^2}{(z-a)(z-b)}\right\}$$

No. of Printed Pages : 04 Roll No. .....

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B. Tech. EXAMINATION, 2022

(Third Semester)

(C Scheme) (Main & Re-appear)

(CSE)

MATH207C

MATHEMATICS-III (PDE&T)

Time : 3 Hours] [*Maximum Marks : 75*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Solve :

$$\left(x^2 - yz\right)p + \left(y^2 - zx\right)q = z^2 - xy$$

(b) Solve :

$$2z + p^2 + qy + 2y^2 = 0$$

2. (a) Solve :

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = y\cos x$$

(b) Solve :

$$\left(\mathrm{D}^2 + 2\mathrm{DD}' + \mathrm{D}'^2 - 2\mathrm{D} - 2\mathrm{D}'\right)z = \sin\left(x + 2y\right)$$

Unit II

3. (a) Solve by the method of separation of variables :

$$\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$$

given that $u(0, y) = 8e^{-3y}$.

(b) Using D'Alembert's method, find the deflection of a vibrating string of unit length having fixed ends, with initial velocity zero and initial deflection $f(x) = a\left(x - x^2\right)$.

4. Obtain the solution of one-dimensional diffusion equation by the method of separation of variables.

Unit III

5. (a) Find Laplace transform of cosh *at* sin *at*.

(b) Evaluate :

$$\int_0^\infty \frac{e^{-at} - e^{-bt}}{t}\,dt$$

6. (a) Find the inverse Laplace transform of :

$$\frac{5s + 3}{\left(s - 1\right)\left(s^2 + 2s + 5\right)}$$

(b) Solve :

$$\frac{d^2x}{dt^2} + 9x = \cos 2t$$