OLE-24022

B. Tech. 3rd Semester (Fire Tech. & Safety) (Common for All Branches) Examination – April, 2021

MATHEMATICS-III

Paper : Math-201-F

Time : Three Hours]   *[Maximum Marks :100*

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

Note : Attempt *five* questions in total, by selecting *one* question from each Section. Question No. **1** is *compulsory*.

1. (a) Write conditions for Fourier series expansion.

   (b) Separate into real and imaginary parts Log(4 + 3i).

   (c) Define radius and circle of convergence for power series.

(d) Define Linear programming problem with the help of suitable example.

SECTION – A

2. Expand $f(x) = x \sin x$, $0 < x < 2\pi$ as a Fourier Series.

3. Find the Fourier cosine transform of $f(x) = \dfrac{1}{1+x^2}$.

SECTION – B

4. Show that the function $u = e^{-2xy} \sin(x^2 - y^2)$ is harmonic. Find the conjugate function v and express $u + iv$ as an analytic function of z.

5. (a) Evaluate $\displaystyle\oint_C \dfrac{\cos \pi z^2}{(z-1)(z-2)}\, dz$, where C is the circle

(z) = 3.

(b) Evaluate $\displaystyle\oint_C \dfrac{e^z}{z-2}\, dz$, where C is the circle $|z| = 3$ or $|z| = 1$.

SECTION – C

6. (a) Expand $f(z) = \dfrac{z}{(z+1)(z+2)}$ about z = –2.

(b) Determine the poles of the function $f(z) = \dfrac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole.

7. The contents of urns I, II and III are as follows : 1 white, 2 black and 3 red balls; 2 white, 1 black and 1 red balls; 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urns I, II or III ?

SECTION – D

8. Fit a Poisson distribution to the following data and test the goodness of fit.

x	0	1	2	3	4
f	109	65	22	3	1

9. Solve the following LPP by simplex method :

Minimize $Z = x_1 - 3x_2 + 3x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$,

$$2x_1 + 4x_2 \geq -12,$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10,$$

$$x_1, x_2, x_3 \geq 0.$$

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