

Roll No.

24022

**B. Tech 3rd Semester (CS & IT)
Examination – December, 2017**

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 : Question No. 1 is compulsory. Attempt total five questions, selecting one question from each Section. All questions carry equal marks.

1. (a) If $f(x) = \left(\frac{x-2}{2}\right)^2$, $0 < x < 2\pi$, find a_n .

2.5 × 8 = 20

(b) Find the Fourier Cosine transform of $f(x) = e^{-ax}$.

24022-17150-(P-7)(Q-9)(17)

P. T. O.

(c) State Convolution Theorem for Fourier Transform.

(d) State Residue Theorem.

(e) Prove that :

$$\tan\left(i \log \frac{a-ib}{a+ib}\right) = \frac{2ab}{a^2-b^2}$$

(f) Evaluate $\oint_c \frac{e^{-z}}{z+1} dz$, where c is the circle $|z| = \frac{1}{2}$.

(g) If A and B are two events such that $P(A) = \frac{1}{4}$,

$$P(B) = \frac{1}{3} \text{ and } P(A \cup B) = \frac{1}{2}. \text{ Show that } A \text{ and } B$$

are independent events.

(h) If X is a normal variable with mean 30 & standard deviation 5; find the probabilities that :

(a) $20 \leq X \leq 40$.

(b) $X \geq 45$.

2. (a) Find the Fourier series of the function :

$$f(x) = x \sin x, -\pi \leq x \leq \pi$$

Also deduce that :

$$\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \dots = \frac{\pi-2}{4}$$

(b) Expand $f(x)$ as a Fourier series if :

$$f(x) = \begin{cases} \pi x & , 0 < x < 1 \\ \pi(2-x) & , 1 < x < 2 \end{cases}$$

3. (a) Find the Fourier transform of :

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

Hence evaluate :

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

(b) Find the Fourier sine transform of :

$$\frac{1}{x(x^2 + a^2)}$$

SECTION - B

4. (a) If $\tan(\theta + i\phi) \tan \alpha + i \sec \alpha$, show that :

(i) $e^{2\phi} = \pm \cot \alpha/2$

(ii) $2\theta = (n + 1/2)\pi + \alpha$

(b) Determine the analytic function whose real part is :

$$e^{2x}(x \cos 2y - y \sin 2y)$$

5. (a) Define line integral of $f(z)$. Prove that :

$$\int_C \frac{dz}{z} = -\pi i \text{ or } \pi i,$$

According as c is the semi-circular arc $|z| = 1$ above or below of the real axis.

24022-17150-(P-7)(Q-9)(17) (4)

(b) Using Cauchy's Integral Formula, Evaluate :

$$\oint \frac{\sin^6 z}{(z - \pi/3)^3} dz$$

around the circle $|z| = 1$.

SECTION - C

6. (a) Expand $e^{2z}/(z-1)^3$ about the singularity $z = 1$ in Laurant's series.

(b) Evaluate :

$$\int_0^\pi \frac{1}{a + b \cos \theta} d\theta,$$

where $a > b$.

7. (a) The contents of Urn I, II and III are as follow 1 white, 2 black and 3 red balls, 2 white, 1 black and 1 red balls and 4 white, 5 black and 3 red balls.

24022-17150-(P-7)(Q-9)(17) (5)

P. T. O.

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 I, II or III ?

(b) Fit a normal curve to the following distributions :

| | | | | | | |
|---|---|---|---|---|---|----|
| x | : | 2 | 4 | 6 | 8 | 10 |
| f | : | 1 | 4 | 6 | 4 | 1 |

SECTION - D

8. A survey of 320 families with 5 children each revealed the following distribution :

| | | | | | | | |
|-----------------|---|----|----|-----|----|----|----|
| No. of Boys | : | 5 | 4 | 3 | 2 | 1 | 0 |
| No. of Girls | : | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of Families | : | 14 | 56 | 110 | 88 | 40 | 12 |

Is this result consistent with the hypothesis that male and female births are equally probable ?

24022-17150-(P-7)(Q-9)(17) (6)

9. Using Simplex Method solve the following LPP :

Maximize : $z = 2x_1 + 5x_2$

Subject to :

$$x_1 + 4x_2 \leq 24$$

$$3x_1 + x_2 \leq 21$$

$$x_1 + x_2 \leq 9$$

$$x_1, x_2 \geq 0$$

<http://haryanapapers.com>

Whatsapp @ 9300930012

Your old paper & get 10/-

पुराने पेपर्स भेजे और 10 रुपये पायें,

Paytm or Google Pay से

24022-17150-(P-7)(Q-9)(17) (7)