
Roll No.

24022

**B. Tech. 3rd Semester (CSE)
Examination – December, 2018**

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 all, by selecting *one* Question from each Section. Question No. 1 is *compulsory*.

1. Compulsory question :

- (a) State Dirichlet's condition for existence of fourier series of a function.
- (b) If $F_s(S)$ and $F_c(S)$ are fourier sine and cosine transform of $f(x)$ respectively, then show that :

(i)
$$F_s(xf(x)) = \frac{-d}{ds} \{F_c(s)\}$$

(ii) $F_c(xf(x)) = \frac{d}{ds} \{F_s(s)\}$

(c) Show that :

$$f(z) = \frac{x^2 y^3 (x + iy)}{x^6 + y^{10}}, \quad z \neq 0, \quad f(0) = 0$$

is not analytic at origin.

(d) Evaluate :

$$\int_0^{1+i} (x^2 - iy) dz \text{ along the path } y = x^2$$

(e) Find the radius of convergence of the power series : <http://www.HaryanaPapers.com>

$$\sum \frac{2^{-n} z^n}{1 + in^2}$$

(f) A variate X has the probability distribution :

X:	-3	6	9
P[X = x]:	1/6	1/2	1/3

Find $E[(2x+1)^2]$.

(g) Write a short note on :

(i) Test of significance

(ii) Errors

(h) Solve graphically Max $z = 3x + 4y$, subject to the constraints $2x + 4y \leq 40$; $2x + 5y \leq 180$, $x \geq 0, y \geq 0$.

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SECTION - A

2. (a) Find the fourier series expansion of $f(x)$ if: 10

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

and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

(b) Develop $f(x)$ in a fourier series in the interval $(0,2)$ if: 10

$$f(x) = x, 0 < x < 1 \\ = 0, 1 < x < 2$$

3. (a) Express $f(x) = \begin{cases} 1 & , 0 \leq x \leq \pi \\ 0 & x > \pi \end{cases}$ as a fourier sine integral and hence evaluate $\int_0^\infty \frac{1 - \cos(\pi\lambda)}{\lambda} \sin(x\lambda) d\lambda$. 10

(b) Find the fourier cosine transform of e^{-x^2} . 10

SECTION - B

4. (a) Express $\text{Log}(\log i)$ in the form $A + iB$. 10

(b) If $\tan(\theta + i\phi) = \tan \alpha + i \sec \alpha$, show that: 10

$$e^{2\phi} = \pm \cot \alpha / 2 \text{ and } 2\theta = \left(n + \frac{1}{2}\right) \pi + \alpha \quad 10$$

5. (a) If $w = \phi + i\psi$ represents the complex potential function for an electric field and $\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$, determine ϕ . 10

(b) Evaluate $\oint_C \frac{e^{-2z}}{(z+1)^3} dz$, where C is the circle $|z|=2$ by using Cauchy's integral formula. 10

SECTION - C

6. (a) Expand $\frac{e^{2z}}{(z-1)^3}$ about the singularity $z=1$ in Laurent series. 10

(b) Evaluate the integral

$$\int_0^{2\pi} \frac{d\theta}{1 - 2r \sin \theta + r^2}, (0 < r < 1). \quad 10$$

7. (a) A bag X contains 2 white and 3 red balls and a bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y. 10

- (b) A certain screw making machine produces on average 2 defective screw out of 100, and packs them in boxes of 500. Find the probability that a box contains 15 defective screws. 10

SECTION - D

8. (a) 325 men out of 600 men chosen from a big city were found to be smokers. Does this information support the conclusion that the majority of men in the city are smokers. 10

- (b) Two independent samples of size 7 and 9 have the following values: 10

Sample A :	10	12	10	13	14	11	10	-	-
Sample B	10	13	15	12	10	14	11	12	11

Test whether the difference between the mean is significant.

9. (a) Using Simplex method, solve : 10

$$\text{Max } z = x_1 + x_2 + 3x_3$$

Subject to $3x_1 + 2x_2 + x_3 \leq 3$, $2x_1 + x_2 + 2x_3 \leq 2$,
 $x_1, x_2, x_3 \geq 0$.

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- (b) Using Dual simplex method, solve : 10

$$\text{Min } z = x_1 + 2x_2 + 3x_3$$

Subject to :

$$2x_1 - x_2 + x_3 \geq 4, x_1 + x_2 + 2x_3 \leq 8, x_2 - x_3 \geq 2$$

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

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