

BT-4/M-21

44120

MATHS-III

Paper-AS-201N

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT-I

1. (a) Expand $f(x) = x - x^2$ as a Fourier series in the interval $-\pi$ to π . 7½
- (b) Expand $f(x) = |\cos x|$ as a Fourier series in the interval $(-\pi, \pi)$. 7½
2. (a) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$. 7½
- (b) Using Parseval's identity, prove that $\int_0^{\infty} \frac{dx}{(x^2 + 1)^2} = \frac{\pi}{4}$. 7½

UNIT-II

3. (a) Form the partial differential equations (by eliminating the arbitrary functions) from $z = f(x + at) + g(x - at)$. 5

- (b) Find the complete integral of $z = px + qy + p^2 + q^2$ using Charpit's method where $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$. 10

4. Solve the following linear programming problem by Simplex method

Maximize $Z = 4x_1 + 10x_2$

subject to

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1, x_2 \geq 0$$

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UNIT-III

5. (a) If $\cos(\theta + i\phi) = \cos \alpha + i \sin \alpha$ prove that $\sin^2 \theta = \pm \sin \alpha$. 7½
- (b) Find the analytic function whose imaginary part is

$$\frac{x - y}{x^2 + y^2}. \quad 7\frac{1}{2}$$

6. (a) Evaluate $\oint_C \frac{\sin^2 z}{\left(z - \frac{\pi}{6}\right)^3} dz$ using Cauchy's integral formula, where C is the circle $|z| = 1$. 7½

- (b) Find Taylor's expansion of $f(z) = \frac{1}{(z+1)^2}$ about the point $z = -i$. 7½

UNIT-IV

7. (a) If the probability of a bad reaction from a certain injection is 0.001. Determine the chance that out of 2000 individuals more than two will get a bad reaction. 7½
- (b) A pair of dice is tossed twice. Find the probability of scoring 7 points (i) once (ii) at least once (iii) twice. 7½
8. (a) X is normal variate with mean 30 and standard deviation 50. Find the probabilities that (i) $26 \leq X \leq 40$ (ii) $X \geq 45$ (iii) $|X - 30| > 5$. 10
- (b) If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{1}{2}$. Evaluate (i) $P(A|B)$ (ii) $P(B|A)$ (iii) $P(A \cap B')$. 5
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