Roll No. ..... Total Pages : 3

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

$$2x_1 + x_2 \leq 50$$
$$2x_1 + 5x_2 \leq 100$$
$$2x_1 + 3x_2 \leq 90$$
$$x_1, x_2 \geq 0$$ 15

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 $\frac{x - y}{x^2 + y^2}$. 7½

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