

7. (a) In a bolt factory there are four machines A, B, C, D manufacturing 20%, 15%, 25%, and 40% of total output respectively. Of their output 5%, 4%, 3% and 2% in the same order are defective bolts. A bolt is chosen at random from the factory's production and is found defective. What is the probability that the bolt was manufactured by machine 'A' or machine 'D'? 10

- (b) Fit the normal curve to the following distribution

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

Unit-IV

8. Using Simplex method maximize, $z = 3x_1 + 5x_2 + 4x_3$ subject to $2x_1 + 3x_2 \leq 8$; $2x_2 + 5x_3 \leq 10$
 $3x_1 + 2x_2 + 4x_3 \leq 15$; $x_1, x_2, x_3 \geq 0$ 20
9. (a) Verify whether Poisson distribution can be assumed from the data given below: 10

No. of defects	0	1	2	3	4	5
Frequency	6	13	13	8	4	3

- (b) The nine items of a sample have the following values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these values differ significantly from the assumed mean 47.5. 10

B.Tech. 3rd Semester AEIE F Scheme Examination,

December-2016

MATHEMATICS-III

Paper-Math-201-F

Time allowed : 3 hours] [Maximum marks : 100

Note: Question No. 1 is compulsory. Attempt five questions by taking one from each unit. All questions carry equal marks.

1. (a) Expand $(\pi x - x^2)$ in a half range sine series in the interval $(0, \pi)$ up to first three terms. 5
- (b) Separate $\log(\sin z)$ into real and imaginary parts where $z = x + iy$. 5
- (c) Expand " $\frac{1}{z^4 + 3z^2 + 2}$ " as Laurent's series valid for $1 < |z| < \sqrt{2}$. 5
- (d) Solve the following LPP by graphical method
 Minimize $z = 20x_1 + 10x_2$
 subject to constrains $x_1 + 2x_2 \leq 40$; $4x_1 + 3x_2 \geq 60$
 $3x_1 + x_2 \geq 30$; $x_1, x_2 \geq 0$ 5

Unit-I

2. (a) If $f(x) = \begin{cases} 0 & ; \text{ for } -\pi \leq x \leq 0 \\ \sin x & ; \text{ for } 0 \leq x \leq \pi, \end{cases}$ then prove

$$f(x) = \frac{1}{\pi} + \frac{1}{2} \sin x - \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{\cos 2nx}{4n^2 - 1} \quad 10$$

- (b) Find the Fourier transform of

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

and use it to evaluate

$$\int_0^{\infty} \left(\frac{x \cos x - \sin x}{x^3} \right) \cos \left(\frac{x}{2} \right) dx. \quad 10$$

3. (a) Find Fourier sine transform of $\frac{1}{(x^2 + a^2)^2}$. 10

- (b) Find Fourier sine and cosine series of

$$f(x) = \begin{cases} x & ; 0 < x < \frac{\pi}{2} \\ 0 & ; \frac{\pi}{2} < x < \pi \end{cases} \quad 10$$

Unit-II

4. (a) Determine the analytic function whose real part is $e^{2x}(x \cos 2y - y \sin 2y)$ 8

- (b) By using Cauchy's integral formula evaluate

(i) $\oint_C \left(\frac{e^z}{z^2 + 2z + 1} \right)^2 dz$, where C is the circle $|z| = 2$ 6

(ii) $\oint_C \frac{\cos \pi z^2}{z^2 - 3z + 2} dz$, where C is the circle $|z| = 2.5$ 6

5. (a) If $\tan(\theta + i\phi) = \cos \alpha + i \sin \alpha$, then prove that

$$\theta = \frac{n\pi}{2} + \frac{\pi}{4} \quad \text{and} \quad \phi = \frac{1}{2} \log \tan \left(\frac{\pi}{4} + \frac{\alpha}{2} \right) \quad 10$$

- (b) State and prove Cauchy's Integral formula. 10

Unit-III

6. (a) Evaluate $\oint_C \frac{z^2 - 3z}{z^3 + 2z^2 + 5z} dz$, where C is the

circle (i) $|z + 1 - i| = 2$, (ii) $|z + 1 + i| = 2$ 6+6=12

(b) Prove that $\int_0^{2\pi} \frac{\sin^2 \theta}{a + b \cos \theta} d\theta + \frac{2\pi}{b^2} (a - \sqrt{a^2 - b^2})$

where $0 < b < a$. 8