7. (a) Prove that mean and variance of the Poisson distribution are equal.

(b) A survey was conducted to find the supplies of the consumer durables for the market. It was found that the three major companies A, B and C have market share of 35%, 25% and 40% respectively out of which 2%, 1% and 3% are not upto the satisfaction. A consumer buys a product and is dissatisfied with it. What is the probability that it might be from the company C ?

SECTION – D

8. Verify whether Poisson distribution can be assumed from the data given below :

x :	0	1	2	3	4
f :	109	65	22	3	1

9. Maximize $z = -2x_1 - x_2$

Subject to $3x_1 + x_2 \geq 3$,

$$4x_1 + 3x_2 \geq 6,$$
$$x_1 + 2x_2 \geq 3$$
$$x_1, x_2 \geq 0$$

by dual simplex method.

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B. Tech. 3rd Sem. (AEIE)

Examination – December, 2015

MATHEMATICS - III

Paper : Math-201-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the question, 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 total selecting at least ***one*** question from each Section. Question No. **1** is ***compulsory***.

1. (a) Find a_n for $f(x) = |x|, -\pi < x < \pi$.

(b) Define Analytic function and hence state necessary and sufficient conditions for a function to be analytic.

(c) Define discrete and continuous probability distribution.

(d) Maximize $Z = 2x + 3y$

Subject to $x + y \le 30$,

$3 \le y \le 12$,

$x - y \ge 0,\ 0 \le x \le 20$

by graphical method.

SECTION – A

2. (a) Find the Fourier series for

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

(b) Find the half range cosine series for $f(x) = x^2$ in the interval $0 \le x \le \pi$.

3. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2},\ x > 0, t > 0$

Subject to the conditions :

(i) $u = 0$, when $x = 0,\ t > 0$

(ii) $u = \begin{cases} 1, & 0 < x < 1 \\ 0, & x \ge 1 \end{cases}$ when $t = 0$ and

(iii) $u(x,t)$ is bounded.

SECTION – B

4. (a) If $a + ib = \tan h\left(v + \frac{i\pi}{4}\right)$, prove that $a^2 + b^2 = 1$.

(b) If $f(z) = \begin{cases} \frac{x^3 y (y - ix)}{x^6 + y^2}, & z \ne 0 \\ 0 & z = 0 \end{cases}$

Prove that $\frac{f(z) - f(0)}{z} \to 0$ as $z \to 0$ along any radius vector but not as $z \to 0$ in any manner and also that $f(z)$ is not analytic at $z = 0$.

5. (a) State and prove Cauchy's integral theorem.

(b) Evaluate $\oint_C \frac{3z^2 + z}{z^2 - 1} dz$, where c is the circle $|z - 1| = 1$.

SECTION – C

6. (a) Find the sum of the residues of the function $f(z) = \frac{\sin z}{z \cos z}$ at its pole inside the circle $|z| = 2$.

(b) Evaluate :

$$\int_0^{2\pi} \frac{d\theta}{2 + \cos\theta}$$