Maximize: $Z = -3 x_1 - 2 x_2$ subject to:



$$X_1 + X_2 \ge 1,$$

$$x_1 + x_2 \le 7,$$

$$x_1 + 2 x_2 \ge 10,$$

$$x, \leq 3$$

$$X_1, X_2 \geq 0$$

by using dual simplex method.

(Graph Paper)

B. Tech. 4th Semester (BME) Examination,

May-2016

MATHEMATICS-III

Paper-Math-201-F

Time allowed: 3 hours]

[Maximum marks: 100

Note: Attempt five questions in total, selecting at least one question from each section. Q. No. 1 is compulsory.

- 1. Find a_n for $f(x) = x - x^2$, -1 < x < 1.
 - Examine sin z is analytic or not analytic.
 - Define residue at a pole and state Cauchy's residue theorem.
 - Minimize: $Z = 20 x_1 + 10 x_2$ subject to:

$$x_1 + 2 x_2 \le 40,$$

 $3 x_1 + x_2 \ge 30,$
 $4 x_1 + 3 x_2 \ge 60,$
 $x_1, x_2 \ge 0$

by graphical method.

Section-A

2. Find Fourier series for

$$f(x) = \begin{cases} \pi + x & \text{for } -\pi < x < 0 \\ 0 & \text{for } 0 \le x < \pi \end{cases}$$

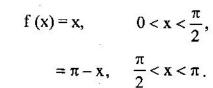
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(b) Obtain half range cosine series for



3. Solve:

 $\frac{\partial V}{\partial t} = k \frac{\partial^2 v}{\partial x^2} \text{ for } x > 0, t > 0 \text{ under the boundary}$ $\text{conditions } V = V_0 \text{ when } x = 0, t > 0 \text{ and the initial}$ condition V = 0 when t = 0, x > 0.

Section-B

4. (a) If $\tan (\theta + i \phi) = \cos \alpha + i \sin \alpha = e^{i\alpha}$, prove that:

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

- (b) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin, even though C. R. equations are satisfied there at.
- 5. (a) State and prove Cauchy's integral theorem.
 - (b) Evaluate:

$$\oint_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz \text{ where C is the circle } |z| = 3.$$

Section-C

6. (a) Find the series expansion of

$$f(z) = \frac{z^2 - 1}{z^2 + 5z + 6}$$
 about $z = 0$ in the region

- (i) |z| < 2
- (ii) 2 < |z| < 3.
- (b) Evaluate:

 $\oint_C \tan z \, dz$, where C is the circle |z| = 2.

- 7. (a) Prove that the total area under normal probability curve is unity.
 - (b) A factory has two machines A and B. Past record shows that machine A produced 60% of the items of output and machine B produced 40% of the items. Further, 2% of the items produced by machine A were defective and 1% produced by machine B were defective. If a defective item is drawn at random, what is the probability that it was produced by machine A?

Section-D

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

X	0	1	2	3	4	5	6
f	13	25	52	58	32	16	4