

3E1704

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**B. Tech. IIIrd Semester (Main/Back) Examination, Feb. - 2011
Common for Ceramic, AI, EC, BM & EIC
Mathematics - III**

Time : 3 Hours**Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

*Attempt overall **five** questions, selecting **one** question from **each** unit. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitable be assumed and stated clearly.*

Unit - I

1. a) Using Laplace transform, prove that (8)

$$\int_0^{\infty} \frac{\sin t}{t} dt = \frac{\pi}{2}$$

- b) Find $L^{-1} \left\{ \frac{1}{s} \log \left(1 + \frac{1}{s^2} \right) \right\}$ (8)

OR

Using Laplace transform solve the following differential equation.

$$\frac{\partial y}{\partial t} = 2 \frac{\partial^2 y}{\partial x^2}$$

Where $y(0,t) = 0 = y(5,t)$, $y(x,0) = 10 \sin 4\pi x$. (16)**Unit - II**

2. a) Express $f(x) = |x|$, $-\pi < x < \pi$ as a Fourier series and hence show that

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$$
 (8)

- b) Find the z-transform of $a^n \cos n\theta$ and $a^n \sin n\theta$. (8)

Unit - V

5. a) Obtain expansion for $\frac{z^2 - 4}{(z+1)(z+4)}$, which are valid, for the regions :

i) $|z| < 1$

ii) $1 < |z| < 4$ and

iii) $|z| > 4$.

(8)

b) By Contour integral prove that

$$\int_0^{\infty} \frac{\sin mx}{x} dx = \frac{\pi}{2} (m > 0).$$

(8)

OR

a) Show that $\int_0^{2\pi} \frac{d\theta}{a + b \sin \theta} = \frac{2\pi}{\sqrt{a^2 - b^2}}$ if $|a| > |b|$

(8)

b) Find the residue of $\frac{z^2}{(z-a)(z-b)(z-c)}$ at infinity.

(8)