

3E1704Roll No. : 10EKTECOY6Total Printed Pages : 4**3E1704****B.Tech. (Sem. III) (Main/Back) Examination, January - 2012****Electronics & Comm.****3EC1 Mathematics-III****(Common for Ceramic (3CRE4), 3EC1, 3AI1, 3EI1 & 3BM1)**Time : **3 Hours**][Total Marks : **80**[Min. Passing Marks : **24****Instructions to Candidates :**

Attempt any **five** questions selecting **one** question from each unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Nil2. Nil**UNIT - I**

- 1 (a) Find the Laplace transform of $\sin \sqrt{t}$. Hence find the Laplace transform of $\frac{\cos \sqrt{t}}{\sqrt{t}}$.

(b) Solve : $\frac{d^2 y}{dt^2} + 2 \frac{dy}{dt} + y = t$ given that $y(0) = -3, y(1) = -1$

OR

- 1 (a) Find the inverse Laplace transform with the help of convolution theorem of $\frac{s}{(s^2 + a^2)^2}$.

(b) Solve : $\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$ where $u = u(x, t)$.

B.C. : $u(0, t) = 0 = u(5, t)$ and $u(x, 0) = 10 \sin 4\pi x$



UNIT - II

- 2 (a) Find the Fourier series for the function defined as :

$$f(x) = \begin{cases} -1, & \text{for } -\pi \leq x < 0 \\ 0, & \text{for } x = 0 \\ 1, & \text{for } 0 < x \leq \pi \end{cases}$$

Hence prove that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

- (b) For z transform prove that

$$z(mu_n) = -z \frac{d}{dz} z(u_n)$$

with the help of this find the z transform of ne^{-an} , $n \geq 0$.

OR

- 2 (a) Obtain the constant term and the coefficients of first sine and cosine terms in the fourier expansion of y as given in the following table :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

- (b) Find the inverse z -transform of

$$f(z) = \frac{1}{(z-3)(z-2)}$$

If RDC is (i) $|z| < 2$ (ii) $2 < |z| < 3$ (iii) $|z| > 3$.

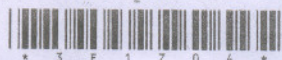
UNIT - III

- 3 (a) Find the Fourier cosine transform of e^{-x^2} .

- (b) Solve $\frac{\partial V}{\partial t} = \frac{\partial^2 V}{\partial x^2}$ if (i) $V_x(0, t) = 0$ (ii) $V(x, 0) = \begin{cases} x, & 0 \leq x < 1 \\ 0, & x > 1 \end{cases}$

and (iii) $V(x, t)$ is bounded $x > 0, t > 0$.

OR



3 (a) Find $f(x)$ if its Fourier cosine transform is $\frac{1}{1+s^2}$.

(b) Solve $\frac{\partial \theta}{\partial t} = k \frac{\partial^2 \theta}{\partial x^2}$, $x > 0, t > 0$

with B.C. : $\theta = \theta_0$ when $x=0, t > 0$

and I.C. : $\theta = 0$ when $t=0, x > 0$

UNIT - IV

4 (a) Define analytic function and derive Cauchy-Riemann conditions for analytic function and examine the nature of the function

$$f(z) = \frac{x^2 y^5 (x+iy)}{x^4 + y^{10}}, \quad z \neq 0, \quad f(0) = 0$$

in the region including the origin.

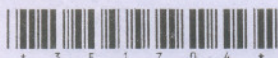
(b) If $(u-v) = (x-y)(x^2 + 4xy + y^2)$ and $f(z) = u+iv$ is an analytic function of $z = x+iy$ find $f(z)$ in terms of z .

OR

4 (a) Find the bilinear transformation which maps the points $z = 1, i, -1$ respectively on to the points $w = i, 0, -i$.

For this transformation, find the image of concentric circles $|z| = r, (r > 1)$.

(b) Verify Cauchy's theorem for the function $z^3 - iz^2 - 5z + 2i$ if C is the circle $(z-1) = 2$.



UNIT - V

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

- (b) Evaluate $\int_0^{\infty} \frac{1-\cos x}{x^2} dx$ by contour Integration.

OR

- 5 (a) Evaluate $\int_C \frac{z^2 e^{zt}}{z^2+1} dz$ where C is the circle $|z|=2$ and t is a quantity independent of z .

- (b) Use method of contour integration to evaluate

$$\int_0^{2\pi} \frac{d\theta}{1+a^2-2\cos\theta}, 0 < a < 1.$$

