

**4E2114**

Roll No. \_\_\_\_\_

[Total No. of Pages : **3**]**4E2114****B.Tech. IVth Semester (Main/Back) Examination, June - 2010****Electrical Engineering****4EE6.1 Advanced Mathematics (Elective)****Time : 3 Hours****Maximum Marks : 80**

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**Min. Passing Marks : 24****Instructions to Candidates:**

*Attempt overall **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 may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

**Unit - I**

1. a) Given (8)

x:	0	5	10	15	20	25
y:	0	0.0875	0.1763	0.2639	0.3640	0.4663

Determine  $y$  for  $x = 4$  and  $x = 12$ . State the formulae used.

- b) From the following table : (8)

x:	5	6	9	11
y:	12	13	14	16

Obtain  $f(10)$  and  $y$  in terms of  $x$ .

**OR**

- a) Find by Newton's method a root of  $x^3 - 6x + 4 = 0$ .  
Correct to three decimal places. (8)
- b) Use Gauss - Seidel Method to solve  $10x + 2y + z = 9$ ,  $2x + 20y - 2z = -44$ ,  
 $-2x + 3y + 10z = 22$ . (8)

## Unit - II

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2. a) Evaluate numerically  $\int_0^{\pi/2} \sqrt{\cos \theta} d\theta$  using

i)  $\frac{1}{3}$  - formula and

ii)  $\frac{3}{8}$  - formula. (8)

b) Find approximately  $y$  for  $x = 0.2$  for  $\frac{dy}{dx} = x + y^2, y = 1$  when  $x = 0$  (take  $h = 0.1$ ) by modified Euler's method. (8)

OR

a) Given  $\frac{dy}{dx} = x^2 + y^2, y = 1.5$  for  $x = 1$ , use Runge - Kutta method to find  $y$  when  $x = 1.2$  in steps of 0.1. (8)

b) Solve

$$y_{n+2} - 6y_{n+1} + 8y_n = 2^n + 6n. \quad (8)$$

## Unit - III

3. a) Prove that (8)

$$i) J'_n(x) = \frac{n}{x} J_n(x) - J_{n+1}(x).$$

$$ii) J_{n+1}(x) = \frac{2n}{x} J_n(x) - J_{n-1}(x).$$

b) State and prove the Orthogonality property of Bessel functions. (8)

OR

a) Use Rodrigues formula for Legendre polynomials to obtain  $P_3(x)$ . (8)

b) Prove that

$$i) (n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x) \text{ and}$$

$$ii) P'_{2n}(0) = 0. \quad (8)$$

## Unit - IV

4. a) A bag contains 10 white and 15 black balls. Two balls are drawn in succession. Find the probability that one of them is black and the other white. (8)

- b) Fit a Binomial probability distribution to the following frequency distribution :

$x:$	0	1	2	3	4	5	6
$f:$	13	24	52	59	32	16	4

(8)

OR

- a) Four coins are tossed. Find the mathematical expectation of heads thrown. (8)
- b) A source of liquid is known to contain bacteria with the mean number of bacteria per cubic centimetre equal to 3. Ten I.C.C test-tubes are filled with the liquid. Assuming appropriate probability distribution. Calculate the probability that all the test-tubes will show growth i.e. contain at least one bacterium each. (8)

## Unit - V

5. a) Given the data :

(8)

$x:$	1	2	3	4	5	6	7
$y:$	10	12	16	28	25	36	41

Find the co-efficient of correlation between  $x$  and  $y$ . Obtain also the equations of the two regression lines.

- b) Establish the following Z - transforms :

i)  $Z[n a^n] = \left\{ \frac{az}{(z-a)^2} \right\},$

ii)  $Z\left[\frac{1}{n}\right] = \left\{ \log\left(\frac{z}{z-1}\right) \right\}.$

(8)

OR

- a) Find the inverse Z-transform of  $\frac{(3z^2 + 2z)}{(5z-1)(5z+2)}.$

(8)

- b) Use Z-transforms to solve :

$$y_{n+2} - 6y_{n+1} + 9y_n = 3^n, y_0 = y_1 = 0.$$

(8)

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