4E2114

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B. Tech. IVth Semester (Main/Back) Examination, June - 2010
Electrical Engineering
4EE6.1 Advanced Mathematics (Elective)

Time : 3 Hours   **Maximum Marks : 80**

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

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

   $y_{n+2} - 6y_{n+1} + 8y_n = 2^n + 6n.$ (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) $(n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$ and

   ii) $P_{2n}'(0) = 0.$ (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) $Z\left[n\,a^n\right] = \left\{\dfrac{az}{(z-a)^2}\right\}$,

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

(8)

OR

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