

4E 4135

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B.Tech. IV Semester (Main/Back) Examination, June/July - 2015

Electronics and Communication Engg.

4EC6A Advance Engg. Mathematics

Common for AI, BM, EI, CRE, EC, PE, PC

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

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.

Unit - I

1. a) Prove with the usual notations that

i) $E = e^{hD}$

ii) $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{(1+\delta^2)/4}$ (8)

b) Use Stirling's formula to evaluate $f(1.22)$, given (8)

x	:	1.0	1.1	1.2	1.3	1.4
$f(x)$:	0.841	0.891	0.932	0.963	0.985

OR

1. a) Find the cubic polynomial which takes the following values (8)

x	:	0	1	2	3
$f(x)$:	1	2	1	10

b) Using Lagrange's formula express the function

$\frac{x^2 + 6x - 1}{(x^2 - 1)(x - 4)(x - 6)}$ as a sum of partial fractions (8)

Unit - II

2. a) Given that
- | | | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|--------|
| x : | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
| $f(x)$: | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |
- find the first derivative of $f(x)$ at $x=1.1$ (8)
- b) Using modified Euler's method. Find an approximate value of y when $x=0.3$ given that $\frac{dy}{dx} = x + y$ and $y=1$ when $x=0$ (8)

OR

2. a) Evaluate $\int_0^1 \frac{dx}{1+x}$ taking 7 ordinates by applying Simpson's 3/8th rule (8)
- b) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0)=1$ at $x=0.2, 0.4$ (8)

Unit - III

3. a) Express $J_5(x)$ in terms of $J_0(x)$ and $J_1(x)$ (4)
- b) Prove that $J_{5/2}(x) = \sqrt{\frac{2}{\pi x}} \left\{ \frac{3-x^2}{x^2} \sin x - \frac{3}{x} \cos x \right\}$ (4)
- c) Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of legendre polynomials (8)

OR

3. a) Show that $J_n(x) = \frac{1}{\pi} \int_0^\pi \cos(n\theta - x \sin \theta) d\theta$, n being an integer (8)
- b) State and prove orthogonal property of legendre polynomials (8)

Unit - IV

4. a) In a certain college, 4 percent of the men and 1 percent of the women are taller than 6 feet. Furthermore, 60 percent of the students are women. suppose a randomly selected student is taller than 6 feet. Find the probability that the student is a women. (4)

b) Suppose the temperature T during May is normally distributed with mean $\mu = 68^\circ$ and standard deviation $\sigma = 6^\circ$. Find the probability p that the temperature during May is

i) between 70° and 80°

ii) less than 60° (Area Under Normal Curve from 0 to

$$x = \Phi(x); \Phi(2.00) = 0.4772 \quad \Phi(0.33) = 0.1293 \quad \Phi(1.33) = 0.4082 \quad (4)$$

c) Obtain the rank correlation co-efficient for the following data

x : 68 64 75 50 64 80 75 40 55 64

y : 62 58 68 45 81 60 68 48 50 70 (8)

OR

4. a) Six coins are tossed 6400 times. Using the Poisson distribution, determine the approximate probability of getting six heads x times (4)

b) Find the expected value of X for the density function $f(x) = \begin{cases} 2e^{-2x}, & x > 0 \\ 0, & x \leq 0 \end{cases}$ (4)

c) The equations of two regression lines obtained in a correlation analysis of 60 observations are: $5x = 6y + 24$ and $1000y = 768x - 3608$. What is the correlation coefficient? Show that the ratio of coefficient of variability of x to that of y is $5/24$. (8)

Unit - V

5. a) On what curves can the functional

$$I[y(x)] = \int_0^1 \{(y')^2 + 12xy\} dx \quad \text{be extremized?} \quad (8)$$

$$y(0) = 0, y(1) = 1$$

b) Show that the time $t[y(x)]$ spent by a particle on translation along a curve $y=y(x)$, moving with velocity $\frac{dy}{dx} = x$ from the point $(0,0)$ to the point $(1,1)$ is minimum if the curve is a circle having its centre on y -axis (8)

OR

5. a) Derive Euler's equation (8)

b) Find the external of the functional $I[y(x)] = \int_{x_0}^{x_1} (y^2 + y'^2 - 2y \sin x) dx$ (8)