4E2114

**B. Tech. (Sem. IV) (Main / Back) Examination, June/July - 2013
Electrical Engg.
4EE6 Advanced Mathematics**

Time : **3** Hours]

[Total Marks : **80**
[Min. Passing Marks : **24**

*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. _____ **NIL** _____   2. _____ **NIL** _____

UNIT - I

1   (a)   Using Lagrange's formula find the value of $y(2)$ from the
following data :

$x \to$	0	1	4	5
$y \to$	8	11	68	123

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   (b)   Solve :
$$54x + y + z = 110$$
$$2x + 15y + 6z = 72$$
$$-x + 6y + 27z = 85$$
by Gauss - Seidel method.

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OR

1   (a)   Using Stirling's interpolation formula to find $f(35)$ from the
table

$x \to$	20	30	40	50
$y \to$	512	439	346	243

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(b) Find by Newton - Raphson method, the real root of the equation $3x = \cos x + 1$.

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UNIT - II

2 (a) Find $f'(1 \cdot 5)$, using the following data :

$x \rightarrow$	1.5	2.0	2.5	3.0	3.5	4.0
$y \rightarrow$	3.375	7.0	13.625	24	38.875	59

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(b) Apply fourth order Runge - Kutta method to determine $y(0.1)$, given ODE

$$\frac{dy}{dx} = 3x + \frac{1}{2}y, \ y(0) = 1$$

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OR

2 (a) Using Euler modified method, obtain a solution of

$$\frac{dy}{dx} = x + \left| \sqrt{y} \right|, \ y(0) = 1 \quad \text{rtuonline.com}$$

for the range $0 \le x \le 0.4$ in steps of 0.2.

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(b) Solve difference equation
$$y_n - 4y_{n-1} + 5y_{n-2} = 2$$

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UNIT - III

3 (a) Derive following orthogonal properties of Bessel function

$$\int_{0}^{1} x J_n(\alpha x) J_n(\beta x) \, dx = 0, \ \text{if} \ \alpha \ne B$$

$$\int_{0}^{1} x \left[J_n(\alpha x) \right]^2 \, dx = \frac{1}{2} \left[J_n'(\alpha) \right]^2, \ \text{if} \ \alpha = \beta$$

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(b) Prove the recurrence relation for $P_n(x)$

$$(2n+1)xP_n = (n+1)P_{n+1} + nP_{n-1}$$

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OR

3 (a) Prove the recurrence relation for $J_n(x)$

$$xJ'_n(x) = nJ_n(x) - xJ_{n+1}(x)$$

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(b) State and prove orthogonal properties of Legendre polynomials.

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UNIT - IV

4 (a) A letter is known to have come either from CALCUTTA or from TATANAGAR. In the half printed postal stamp of these states only two consecutive letters "TA" are readable. Find the chances of the letter coming from CALCUTTA.

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(b) Probability that a man aged 60 would be alive till the 70 years of the age is 0.65. find the probability that atleast 7 out of 10 such men should be alive till 70 years of age.

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OR

4 (a) Two cards are drawn at random with replacement from a box which contains 4 cards numbered 1, 1, 2 and 2. If X denotes the sum of the numbers shown on the two cards, find the expected value of X.

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(b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find μ and σ of the distribution, given that

if $\phi(t) = \dfrac{1}{\sqrt{2\pi}} \displaystyle\int_0^t e^{-z^2/2} dz$, then $\phi(0.50) = 0.19$ and $\phi(1.41) = 0.42$.

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UNIT - V

5 **(a)** Calculate the Karl Pearson's coefficient of correlation of the following data :

$x \rightarrow$	25	27	30	35	33	28	36
$y \rightarrow$	19	22	27	28	30	23	28

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(b) If $\bar{u}(z) = \dfrac{2z^2 + 5z + 14}{(z-1)^4}$, find u_0, u_1, u_2 and u_3.

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OR

5 **(a)** Obtain the Spearman's rank correlation coefficient for the following data :

$x \rightarrow$	85	74	85	50	65	78	74	60	74	90
$y \rightarrow$	78	91	78	58	60	72	80	55	68	70

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(b) Solve the following difference equation by Z-transform method :

$$u_{n+2} + 4u_{n+1} + 3u_n = 3^n \text{ with } u_0 = 0, \ u_1 = 1.$$

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