4E4176

Roll No.

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B. Tech. IV-Sem. (Main / Back) Exam; April-May 2017

Electrical Engg.

4EE6A Advance Engg. Mathematics - II

(Common to EE and EX)

Time : 3 Hours

Maximum 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. NIL

2. NIL

UNIT - I

1 (a) Prove that $E \equiv e^{hD}$.

4

(b) Solve the following equations by Gauss-Seidel Method, correct upto 3 decimal places :

$$2x - 4y + 10z = -15$$
$$9x + 2y + 4z = 20$$
$$x + 10y + 4z = 6$$

4

(c) Find u_{32} using Stirling's Formula : $u_{20}=14.035$, $u_{25}=13.674$, $u_{30}=13.257$, $u_{35}=12.734$, $u_{40}=12.089$, $u_{45}=11.309$. **8**

OR

1 (a) Find the positive value of $\left(\frac{1}{17}\right)^{1/3}$ correct upto 4 decimal places using Newton-Raphson Method. **4**

(b) Use Lagrange Formula, express the rational function $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ as a sum of partial fractions. **4**

(c) Find least squares fit of the form $y=a+bx^2$ to the following data : **8**

x	−1	0	1	2
y	2	4	10	15

UNIT - II

2 (a) Compute $f'(3)$ from the following table : **4**

x	1	2	4	8	10
y	0	1	5	21	27

(b) Find $\int_0^6 \frac{e^x}{1+x}\,dx$ approximately using Simpson's 3/8th rule of integration.

4

(c) Using Runge Kutta 4th order method, find the value of y when x=1 by taking h=0.5, given that y(0)=1 and $\frac{dy}{dx}=\frac{y-x}{y+x}$.

8

OR

2 (a) The table below gives the results of an observation. θ is observed temperature in degrees centigrade of a vessel of cooling water, t is the time in minutes from the beginning of observations :

t	1	3	5	7	9
θ	85.3	74.5	67.0	60.5	54.3

Find approximate rate of cooling at t=3.5.

4

(b) Find the solution of $\frac{dy}{dx}=1+xy,\ y(0)=1$ which passes through (0,1) in the interval (0, 0.5) using Picard's interation formula upto second approximation.

4

(c) Solve the difference equation $y_{n+2}-2y_{n+1}+y_n=n^2 2^n$.

8

UNIT - III

3 (a) Express $f(x)=x^4+2x^3-6x^2+5x-3$ in terms of Legendre Polynomials. 4

(b) Show that

(i) $P_n(1)=1$

(ii) $P_n(-x)=(-1)^n P_n(x)$. 4

(c) Prove that $J_n(x)=\frac{1}{\pi}\int_0^{\pi}\cos(n\theta-x\sin\theta)d\theta$. 8

OR

3 (a) Prove that $(n+1)P_{n+1}(x)=(2n+1)xP_n(x)-nP_{n-1}(x)$. 4

(b) Find the values of $P_0(x), P_1(x), P_2(x), P_3(x)$ and $P_4(x)$ using Rodrigue's Formula and sketch a rough diagram of these functions between -1 to 1. 4

(c) State and prove orthogonality of Bessel's function of 1st kind. 8

UNIT - IV

4 (a) State axioms of probability and prove that for any two events A and B, $P(A \cup B) = P(A) + P(B) - (A \cap B)$.

4

(b) Probability distribution function of variable x is given by $f(x) = \begin{cases} 2e^{-2x} & x \geq 0 \\ 0 & x < 0 \end{cases}$. Find expected value of $1, x, x^2, x^3, x^4$ (i.e. First four moments of x about the origin).

4

(c) A student is given a true-false examination with 8 questions. If he corrects at least 7 questions, he passes the examination. Find the probability that he will pass given that he guesses all questions.

4

(d) The income of a group of 10,000 persons was found to be normally distributed with mean 750 pm and standard deviation of 50. Show that, of this group, about 95% had income exceeding 668/- and only 5% had income exceeding 832/-. Also find the lowest income among the richest 100. [Area under the normal curve from 0 to $z = \Phi(z)$, $\Phi(1.64) = 0.4495$, $\Phi(0.49) = 2.33$]

4

OR

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 woman.

4

(b) Compute mean of binomial distribution. Is binomial distribution always symmetric ?

4

(c) In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Calculate the approximate number of packets containing no defective, one defective and two defective blades in a consignment of 10,000 packets.

4

(d) The mean weight of 500 male students at a certain college is 151 lb and the standard deviation is 15 lb. Assuming that the weights are normally distributed, find how many students weigh (a) between 120 and 155 lb, (b) more than 185 lb. [Area under the normal curve from 0 to $z = \Phi(z); \Phi(2.10) = .4821, \Phi(0.30) = 0.1179, \Phi(2.30) = 0.4893$]

4

UNIT - V

5 (a) 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

4

(b) If θ is the acute angle between the two regression lines in the case of two variables x and y, show that $\tan\theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ where r, σ_x, σ_y have their usual meanings.

4

(c) Using Z transform, solve the difference equation :

$$y_{n+2} + 10y_{n+1} + 25y_n = n;\ y_0 = 1, y_1 = -5.$$

8

OR

5 (a) Determine Z transform, $Z\{e^{-an}\cos(\beta n)\}$.

4

(b) Find the coefficient of correlation between the values of x and y :

x	1	3	5	7	8	10
y	8	12	15	17	18	20

6

(c) In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are legible : Variance of $x = 9$, regression equations : $8x - 10y + 66 = 0$, $40x - 18y = 214$. What were *(a)* the mean values of x and y *(b)* the standard deviation of y and the co-efficient of correlation between x and y.

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