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4E 2137

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B.Tech. IV Semester (Main/Back) Examination - 2012

Electronics & Comm.

4EC1 Mathematics – IV

Common 4EC1, 4EI6.3, 4AI1, 4BM6.3, 4CRE5

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

Unit - I

1. a) Evaluate $\Delta^6 (ax-1)(bx^2-1)(cx^3-1)$. **(5)**

b) Use stirting formula to find y_{28} given $y_{20} = 49225$ $y_{25} = 48316$ $y_{30} = 47236$ $y_{35} = 45926$ $y_{40} = 44306$ **(5)**

c) Find the value of $f(5)$ from the following table by using Lagrange's interpolation formula. **(6)**

x:	1	2	3	4	7
$f(x)$:	2	4	8	16	128

OR

1. a) Given the following data **(8)**

x	10	11	12	13	14
$10^5 u_x$	23967	28060	31788	35209	38368

Evaluate $u_{10.5}$, $u_{12.5}$ and $u_{13.5}$ by applying suitable interpolation formula stating the formula used.

b) i) Find the missing term from the following table **(4)**

x :	1	2	3	4	5
f(x) :	2	5	7	2y	32

ii) Find the form of the function given by the following table: (4)

x :	3	2	1	-1
y :	3	12	15	-21

Unit - II

2. a) Use simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule to avaluate the following : (8)

$$\int_0^1 \frac{dx}{1+x^2}$$

Hence obtain the approximate value of π in each case.

b) Find $f'(0.02), f'(0.05)$ from the following table: (8)

x :	.01	.02	.03	.04	.05	.06
f(x) :	.1023	.1047	.1071	.1096	.1122	.1148

OR

2. a) Using Runge-kutta method find the approximate value of y(0.2) if $\frac{dy}{dx}=x+y^2$ given that y=1 when x=0, h=0.1. (8)

b) Use Milne's predictor - corrector method to solve the following equation.(8)

$\frac{dy}{dx}=x+y$ with $y(0) = 0, h = 0.1$

Compute the value of y for $0.4 \leq x \leq 0.6$.

Unit - III

3. a) Prove that (8)

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

ii) $x J'_n (x) = x J_{n-1}(x) - n J_n (x)$

iii) $zn J_n (x) = x [J_{n-1} (x) + J_{n+1} (x)]$

b) Prove that (8)

$$P_n\left(-\frac{1}{2}\right) = P_0\left(-\frac{1}{2}\right) P_{2n}\left(\frac{1}{2}\right) + P_1\left(-\frac{1}{2}\right) P_{2n-1}\left[\frac{1}{2}\right] + \dots\dots\dots + P_{2n}\left(-\frac{1}{2}\right) P_0\left(\frac{1}{2}\right)$$

OR

3. a) i) Prove that **(8)**

$$\frac{d}{dx}\left[J_n^2 + J_{n+1}^2\right] = 2\left[\frac{n}{x}J_n^2 - \frac{n+1}{x}J_{n+1}^2\right]$$

ii) $J_0^2 + 2(J_1^2 + J_2^2 + J_3^2 + ...) = 1$

b) Prove that **(8)**

$$P'_{n+1} + P_n^1 = P_0 + 3P_1 + 5P_2 + ...+ (2n+1)\, P_n$$

Unit - IV

4. a) Ten competitors in a beauty contest got marks by three judges in the following order. **(5)**

First Judge :	1	6	5	10	3	2	4	9	7	8
Second Judge :	6	4	9	8	1	2	3	10	5	7
Third Judge :	3	5	8	4	7	10	2	1	6	9

Use the rank correlation coefficient to discuss which pair of judges have the nearest approach to common testes in beauty.

b) A factory produces razor blades. The probability of its being defective in $\frac{1}{500}$. In 10,000 packets of 10 blades each. Calculate the approximate number of packet **(5)**

a) Having no defective b) one defective blade c) two defective blade (Given $e^{-8.02} = 0.9802$)

c) A perfect cubic die in thrown a large number of times in sets of 8. The occurrence of 5 or 6 is called a success. In what proportion of sets would you expect 3 successes? **(6)**

OR

4. a) Fit a parabolic curve to the following data. **(5)**

x :	2	4	6	8	10
y :	8.07	12.85	31.47	57.38	91.29

b) Calculate the coefficient of correlation between x and y using the following data: **(5)**

x:	1	2	3	4	5	6	7	8	9
y:	9	8	10	12	11	13	14	16	15

c) Suppose that a manufactured product has two defect per unit of product inspected. Using prisson distribution, calculate the probabilities of finding a product without any defect, 3 defects, and 4 defects. (Given $e^{-2} = 0.1353$) **(6)**

Unit - V

5. a) Find the least value of the integral. **(8)**

$$I = \int_P^Q \frac{\sqrt{1+y^{12}}}{y} dx$$

Where P(-1,1) and Q(1,1) are points

b) Define Weak variations, strong variation, Extremal and Derive Euler's Equation and also other forms of Euler's Equation. **(8)**

OR

5. a) Show that the shortest distance between two points in a plane in a straight line. **(5)**

b) Find the shape of the curve of the given perimeter enclosing maximum area. **(5)**

c) Find the extremals of the functional and extremum value of $I = \int_0^2 (x-y^1)^2 \, dx$

Subject to y(0) = 0 and y(2) = 4. **(6)**