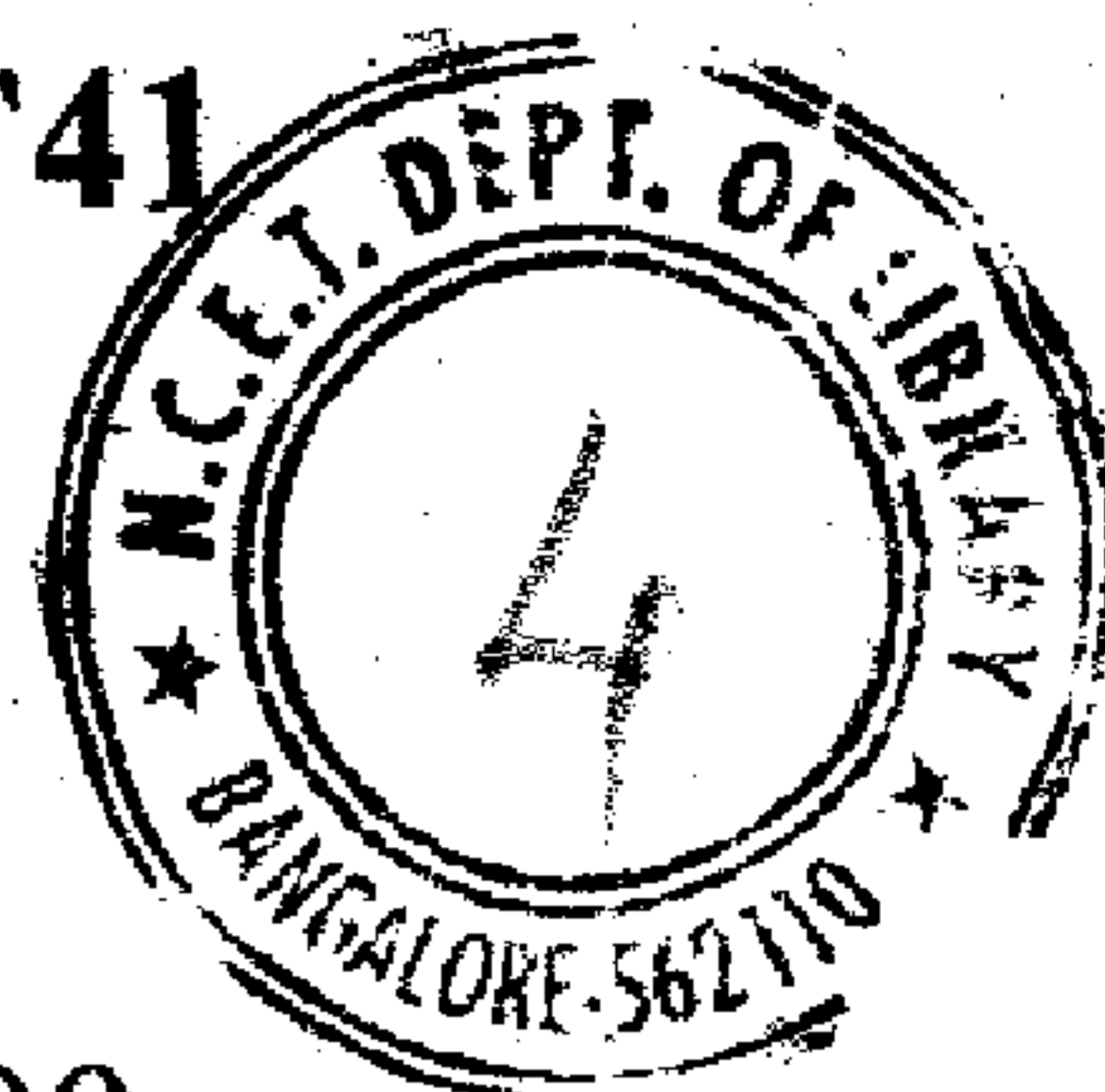


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**Fourth Semester B.E. Degree Examination, June-July 2009**  
**Engineering Mathematics – IV**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

1 a. Solve  $\frac{dy}{dx} = 2y + 3e^x$ ,  $y(0) = 0$ . Using Taylor's series method find  $y(0.1)$ ,  $y(0.2)$ . (06 Marks)

b. Use Runge-Kutta method of fourth order to solve  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$  at  $x = 0.2$  with step length  $h = 0.2$ . (07 Marks)

c. Use Milne's predictor-corrector method to find  $y$  at  $x = 0.8$ , given  $\frac{dy}{dx} = x - y^2$  with,

X	0	0.2	0.4	0.6
Y	0	0.02	0.0795	0.1762

Apply corrector once.

(07 Marks)

2 a. Find the analytic function  $f(z) = u + iv$  if  $v = e^x (x \sin y + y \cos y)$ . (06 Marks)

b. Find the image of lines parallel to  $x$  - axis and lines parallel to  $y$  - axis under the transformation  $w = z^2$ . Draw neat sketch. (07 Marks)

c. Find the bilinear transformation that maps the points  $z = -1, j, 1$  on to the points  $w = 1, j, -1$ . (07 Marks)

3 a. If  $f(z)$  is analytic within and on a simple closed curve  $C$  and 'a' is a point within 'C' then

prove that  $f(a) = \frac{1}{2\pi j} \int_C \frac{f(z)}{z-a} dz$ . (06 Marks)

b. State Cauchy's residue theorem. Hence or otherwise evaluate –

$\int_C \frac{e^{2z}}{(z+2)(z+4)(z+7)} dz$  for 'C' as  $|Z|=3$ . (07 Marks)

c. Find the Taylor's series expansion of  $f(z) = \frac{1}{(z+1)^2}$  about the point  $z = -i$ . (07 Marks)

4 a. Prove that  $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ . (06 Marks)

b. Express polynomial  $2x^3 - x^2 - 3x + 2$  in terms of Legendre polynomials. (07 Marks)

c. Compute  $P_0, P_1, P_2, P_3, P_4$  using Rodrigue's formula. (07 Marks)

**PART – B**

5 a. Fit a parabola  $y = a + bx + cx^2$ , given the data : (06 Marks)

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

b. Obtain the coefficient of correlation and the lines of regression if : (07 Marks)

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

c. A tea set has four sets of cups and saucers. Two of these sets are of one colour and the other two sets are of different colours. (totally three colours). If the cups are placed randomly on saucers, what is the probability that no cup is on a saucer of same colour. (07 Marks)

- 6 a. Define i) Random variable ii) Discrete probability distribution with an example. (06 Marks)
- b. The probability that a man aged 60 will live up to 70 is 0.65. What is the probability that out of 10 men, now aged 60, i) exactly 9, ii) at the most 9 iii) at least 7, will live up to the age of 70 years. (07 Marks)
- c. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation, given that  $A(0.5) = 0.19$  and  $A(1.4) = 0.42$ . (07 Marks)
- 7 a. Find the probability that in 100 tosses of a fair coin between 45% and 55% of the outcomes are heads. (06 Marks)
- b. A mechanist is making engine parts with axle diameter of 0.7 inches. A random sample of 10 parts showed a mean of 0.472 inches with a standard deviation of 0.04 inches. On the basis of this sample, can it be concluded that the work is inferior at 5% level of significance. (07 Marks)
- c. For the following data test the hypothesis that the accidents are uniformly distributed over all the days of the week for 99% confidence.

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
No. of accidents	14	16	8	12	11	9	14	84

(07 Marks)

- 8 a. Find the –  
Marginal distribution of x  
Marginal distribution of y  
Cov (x, y) if the joint pdf of x and y is

	y	1	3	9
x				
2		$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$
4		$\frac{1}{4}$	$\frac{1}{4}$	0
6		$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$

(06 Marks)

- b. Find the fixed probability vector of regular stochastic matrix

$$A = \begin{bmatrix} 0.5 & 0.25 & 0.25 \\ 0.5 & 0 & 0.5 \\ 0 & 1 & 0 \end{bmatrix}$$

(07 Marks)

- c. A company executive changes his car every year. If he has a car of make A, he changes over to make B. from make B he changes over to make C. if he has car 'C' then he gives equal preference to change over to make A or make B car. If he had a car of make C in year 2008 find the probability that he will have a car of i) make A in 2010, ii) make 'C' in 2010.

(07 Marks)

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