B. Tech Degree V Semester (Supplementary) Examination July 2010

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 501 ENGINEERING MATHEMATICS IV

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART - A

(Answer ***ALL*** questions) (8 x 5 = 40)

I. (a) Find the mean and standard deviation of a continuous random variable X having density function.

$$A = f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & x \le 0 \end{cases}$$

(b) Determine the coefficient of correlation between X and Y for the two regression lines $3x+2y=26$ and $6x+y=31$.

(c) A sample of 10 measurements of the diameter of a sphere gave a mean of 111 mm and a standard deviation of 1.5 mm. Find 99% confidence limits for the actual diameter.

(d) A sample of 400 male students is found to have a mean height of 160 cm. Can it be reasonably regarded as a sample from a large population with mean height 162.5 cm and standard deviation 4.5 cm?

(e) Prove that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1+\frac{\delta^2}{4}}$.

(f) Use Lagrange's interpolation formula to find $f(x)$ and hence $f(27)$ from the data given below :

x :	14	17	31	35
$f(x)$:	68.7	64.0	44.0	39.1

(g) Find $\frac{dy}{dx}$ at $x = 1.5$ for the following data.

x :	1.5	2.0	2.5	3.0	3.5
y :	3.375	7.000	13.625	24.000	38.875

(h) Consider the initial value problem $\frac{dy}{dx} = y - x^2 + 1; y(0) = 0.5$. Find $y(0.2)$ by Euler's method.

PART - B (4 x 15 = 60)

II. (a) Derive the mean and variance of uniform distribution. (7)

(b) Fit a Poisson distribution to the following data and find the theoretical frequencies

x :	0	1	2	3	4
f :	109	65	22	3	1

(8)

OR

III. (a) Out of 2000 families with 4 children each, how many would you expect to have
(i) At least one boy
(ii) 2 boys
(iii) No girls (7)

(b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. (8)

(P.T.O)

IV. (a) The standard deviation of height of 16 male students chosen at random in a school of 1000 male students is 6.10 cm. Find 95% and 99% confidence limits of the standard deviation for all male students at the school. (7)

(b) An examination was given to two classes consisting of 40 and 50 students respectively. In the first class, the mean grade was 74 with a standard deviation of 8 while in the second class the mean grade was 78 with a standard deviation of 7. Is there a significant difference between performances of the two classes at a level significance of (i) 0.05 (ii) 0.01 (8)

OR

V. (a) 500 ball bearings have a mean weight of 142.30 gms and a standard deviation of 8.50 gms. Find the probability that a random sample of 100 ball bearings from this group will have a combined weight
(i) between 14,061 and 14,175 gms
(ii) more than 14,460 gms. (7)

(b) Two samples of sodium vapour bulbs were tested for length of life and the following results were got.

	Size	Sample Mean	Sample SD
Type I	8	1234 Hrs.	36 Hrs.
Type II	7	1036 Hrs.	40 Hrs.

Is the difference in the means significant to generalize that Type I is superior to Type II regarding length of life? (8)

VI. (a) Represent $x^4 - 12x^3 + 42x^2 - 30x + 9$ and its successive forward differences in factorial polynomials, taking $h = 1$. (7)

(b) From the following table, find $f(9)$ using Newton's divided difference formula.

x :	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

(8)

OR

VII. (a) The amount A in gm of a substance remaining in a reacting system after an interval of time t minutes in a certain chemical experiment are given below.

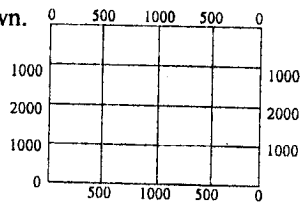
t	2	5	8	11
A	94.8	87.9	81.3	75.1

Obtain the value of A after 9 minutes using Newton's interpolation formula. (7)

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal rule and Simpson's $\frac{1}{3}^{rd}$ rule. (8)

VIII. (a) Solve $\frac{dy}{dx} = xy + y^2, y(0) = 1$ to get y for $x = 0.1$ by Runge – Kutta 4th order. (7)

(b) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown.



(8)

OR

IX. (a) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ in the range $0 \le x \le 0.3$ by taking $h = 0.1$ using modified Euler's method. (7)

(b) Using Bender – Schmidt's method, find the solution of the parabolic equation $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ when $u(0,t) = 0 = u(4,t)$ and $u(x,0) = x(4-x)$.
Assume $h = 1$, find the values up to $t = 5$. (8)

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