B.Tech Degree V Semester Examination November 2011

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)

$(8 \times 5 = 40)$

I. (a) Distinguish between discrete and continuous random variables. Also give examples.

(b) A random variable X has the following probability mass function

Value of $X = x$:	-2	-1	0	1	2	3
$P(x)$:	0.1	k	0.2	2k	0.3	k

Find the value of k.

(c) Explain (i) Null and alternate hypothesis (ii) critical region.

(d) Write a note on test of significance for single mean when standard deviation is known.

(e) Find $\left(\frac{\Delta}{E}\right)^2 f(x)$ where h is the interval of differencing.

(f) Evaluate $(\nabla + \Delta)^2 \left(x^2 + x\right)$, $h = 1$.

(g) Explain Euler's method in solving an ordinary differential equation.

(h) Define initial and boundary value problem.

PART B

$(4 \times 15 = 60)$

II. (a) Find mean and variance of binomial distribution. (7)

(b) A sample of 100 dry battery cells tested to find the length of life produced the following results:

$\bar{x} = 12$ hours ; $\sigma = 3$ hours

Assuming the data to be normally distributed, what percentage of battery cells are expected to have life (i) more than 15 hours (ii) less than 6 hours. (8)

OR

III. (a) If X is a Poisson variate such that $P(X = 2) = 9P(X = 4) + 90P(x = 6)$. Find the standard deviation. (7)

(b) From the following data, obtain the correlation coefficient

$N = 12; \sum x = 30, \sum y = 5, \sum x^2 = 670, \sum y^2 = 285, \sum xy = 334$ (8)

IV. (a) Define (i) significance level (ii) type I and type II errors (iii) point estimation in sampling theory. (6)

(b) A machine is supposed to produce washers of mean thickness of 0.12cm. A sample of 10 washers was found to have mean thickness of 0.128cm and S.D.= 0.008. Test whether the machine is working in proper order at 5% level of significance. (9)

OR

V. (a) A random sample of size 15 is taken from $N\left(\mu, \sigma^2\right)$ has $\bar{x} = 3.2$ and $s^2 = 4.24$. Obtain a 90% confidence interval for σ^2. (6)

(b) A random sample of size 18 is taken from a normal distribution $N(\mu, \sigma^2)$. Test the hypothesis $H_0 : \sigma^2 = 0.36$ against $H_1 : \sigma^2 > 0.36$ at $\alpha = 0.05$, given that the sample variance $s^2 = 0.68$. (9)

VI. (a) If $y(75) = 246$, $y(80) = 202$, $y(85) = 118$, $y(90) = 40$, find $\dot{y}(79)$ using Newton's forward interpolation formula. (8)

(b) Apply Stirling's formula to find $y(25)$ for the following data.

x	20	24	28	32
y	2854	3162	3544	3992

(7)

OR

VII. (a) Use Largrange's interpolation formula to fit a polynomial to the data:

x	0	1	3	4
y	– 12	0	6	12

Find the value of y where $x = 2$. (8)

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{3}{8}$ rule testing $h = \frac{1}{6}$. (7)

VIII. Compute $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of 4^{th} order for the differential equation $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$. (15)

OR

IX. Using Schmidt's method find the value of $u(x,t)$ satisfying the parabolic equation $\frac{4\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ and the boundary conditions

$$u(0,t) = 0 = u(8,t)$$

$$u(x,0) = \frac{x}{2}(8 - x)$$

at the points $x = i$ where $i = 0,1,2,.......,7$ and $dt = \frac{j}{8}$ where $j = 0,1,2,........,5$. (15)

***