BTS (C) – V – (S) – 09 – 028 – A

B. Tech Degree V Semester (Supplementary) Examination July 2009

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

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART - A

(Answer ***ALL*** questions)
(All questions carry ***EQUAL*** marks)

(8 x 5 = 40)

I. (a) Define mathematical expectation of a random variable. Hence find the mean and variance of the *r.v.* with *pdf* $f(x) = k(1 - x^2);\ 0 < x < 1$.

(b) Derive the mean and variance of uniform distribution.

(c) Define (i) Type I and Type II errors
(ii) Significance level

(d) A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a random sample from a large population with mean 3.25 cm and S.D. 1.61 cm.

(e) Prove that (i) $E = 1 + \Delta$

(ii) $\Delta = \dfrac{\delta^2}{2} + \delta\sqrt{1 + \dfrac{\delta^2}{4}}$

(f) Apply Lagrange's formula to evaluate $f(1)$ from the following data :

x	:	-1	0	2	3
$f(x)$	:	-8	3	1	12

(g) Solve the equation $\dfrac{\partial^2 u}{\partial x^2} = 2\dfrac{\partial u}{\partial t}$ when $u(0,t) = u(4,t) = 0$ and $u(x,0) = x(4-x)$ taking $h = 1$. Find the values up to $t = 5$.

(h) Solve by Euler's method

$$\frac{dy}{dx} = x + y;\ y(0) = 1$$

Find $y(0.2)$, $y(0.4)$ and $y(0.6)$.

PART – B

(4 x 15 = 60)

II. (a) Fit a curve of the form $y = ae^{bx}$ by method of least squares :

x	:	0	5	8	12	20
y	:	3	1.5	1	0.55	0.18

(8)

(b) Show that binomial distribution tends to Poisson distribution when $n \to \infty$, $p \to o$ such that np is finite. (7)

OR

(Turn Over)

III. (a) Derive the mean and variance of normal distribution. (8)

(b) Obtain the regression lines for the following data :

x :	1	2	3	4	5
y :	10	12	16	28	25

(7)

IV. (a) Derive the sampling distribution of mean of samples taken from a normal population. (7)

(b) Two random samples drawn from two normal populations are given below :

Sample I :	16	26	27	23	24	22
Sample II :	33	42	35	32	28	31

Do the estimates of populations variances differ significantly. (8)

OR

V. (a) The means of simple random samples of sizes 1000 and 2000 are 67.5 and 68 cm respectively. Can the samples be regarded as drawn from same population of SD 2.5 cm. (8)

(b) Obtain the 90% confidence limit for population mean if a random sample of size 400 is taken from a normal population with SD 3 and sample mean is 48. (7)

VI. (a) Find θ at $x = 43$ and $x = 84$ from the following data :

x :	40	50	60	70	80	90
θ :	184	204	226	250	276	304

(7)

(b) Find the first two derivatives of $x^{1/3}$ at $x = 50$ and $x = 56$ from the table below :

x :	50	51	52	53	54	55	56
y :	3.6840	3.7084	3.7325	3.7563	3.7798	3.803	3.8259

(8)

OR

VII. (a) Apply Newton's divided difference formula to evaluate $f(2)$ from the following table :

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

(8)

(b) Evaluate $\int_{0}^{6} \frac{dx}{1+x^2}$ using trapezoidal rule and Simpson's 1/3 rule. (7)

VIII. (a) Apply Runge Kutta fourth order formula to evaluate $y(0.1)$ where

$$\frac{dy}{dx} = x^2 + y^2;\ y(0) = 1.$$ (8)

(b) Find by Taylor's series $y(0.1)$ and $y(0.2)$ where $\frac{dy}{dx} = x^2 - y,\ y(0) = 1.$ (7)

OR

IX. Solve the Laplace equation. (15)

0	11.1	17	19.7	18.6
0	41	42	43	21.9
0	44	45	46	21
0	47	48	49	17
0	8.7	12.1	12.8	9

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