501 (04-11-2013)

BTS – V – 11.13 – 1117

B.Tech. Degree V Semester Examination November 2013

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 × 5 = 40)

I. (a) Find the mean and variance of a random variable X with probability density function $f(x)=\frac{3}{2}(1-x^2),\ 0<x<1$.

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

(c) A random sample of size 100 showed a mean of 4800 and standard deviation 500. Estimate the population mean with 95% confidence interval.

(d) Define:
   (i) Type I and type II errors
   (ii) Significance level

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

(f) Using Lagrange's interpolation formula, find $y(10)$, given $y(5)=12$, $y(6)=13$, $y(9)=14$ and $y(11)=16$.

(g) Compute the value of $\int_0^6 \frac{dx}{1+x^2}$ using Simpson's one third rule.

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

PART B

(4 × 15 = 60)

II. (a) Derive the mean and variance of binomial distribution. (8)

(b) Fit a Poisson's distribution to the following data and find the theoretical frequencies. (7)

x	0	1	2	3	4
$f(x)$	109	65	22	3	1

OR

III. (a) In a normal distribution, 31% of the items are below 45 and 8% are above 64. Find the mean and variance of the distribution. (7)

(b) Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys (ii) at least 1 boy (iii) no girl. (8)

(P.T.O.)

IV. (a) A random sample of size 15 taken from a normal population $N\left(\mu, \sigma^2\right)$ has mean $\overline{x} = 3.2$ and variance $s^2 = 4.24$. Obtain a 90% confidence interval of σ^2. (7)

(b) A random sample of size 18 taken from a normal population $N\left(\mu, \sigma^2\right)$. Test the hypothesis $H_0 : \sigma^2 = 0.36$ against $H_1 : \sigma^2 > 0.36$ at 5% level of significance, given that the sample variance $s^2 = 0.68$. (8)

OR

V. (a) The mean of a sample of size 20 from a normal population $N\left(\mu, \sigma^2\right)$ was found to be 81.2 with a variance of 8. Find a 90% confidence interval for μ. (7)

(b) The mean life time of a sample of 100 fluorescent light bulbs manufactured by a company is computed to be 1570 hours with a standard deviation of 120 hours. If 'μ' is the mean life time of all bulbs produced by the company, test the hypothesis $\mu = 1600$ against $\mu \neq 1600$ using a level of significance of 0.05 and 0.01. (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) Find the first two derivatives of $y = x^{1/3}$ at $x = 50$ and $x = 56$ from the table given below. (8)

x	50	51	52	53	54	55	56
y	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

OR

VII. (a) Prove that $\left(\dfrac{\Delta^2}{E}\right)e^x \times \left(\dfrac{Ee^x}{\Delta^2 e^x}\right) = e^x$. (7)

(b) Apply Stirling's formula to show that tan 16° = 0.2867 from the following data. (8)

θ	0°	5°	10°	15°	20°	25°	30°
$\tan\theta$	0.0000	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

VIII. Compute $y(0.1)$, $y(0.2)$ and $y(0.3)$ by Runge-Kutta 4th order method, given that $\dfrac{dy}{dx} = xy + y^2$ with $y(0) = 1$. (15)

OR

IX. Solve the elliptic equation $U_{xx} + U_{yy} = 0$ for the square mesh with the boundary values as shown. (15)

0	500	1000	500	0
1000	u_1	u_2	u_3	1000
2000	u_4	u_5	u_6	2000
1000	u_7	u_8	u_9	1000
0	500	1000	500	0

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