B. Tech Degree V Semester Special Supplementary Examination June 2012

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) A continuous random variable X has the probability distribution $f(x) = ae^{-2|x|}$ $-\infty < x < \infty$; find the (i) value of 'a (ii) mean (iii) standard deviation of the distribution.

(b) It has been claimed that in 60% of all solar heat installations the utility bill is reduced by atleast one third. What are the probabilities that the utility bill will be reduced by atleast one third in
   (i) four of five installations
   (ii) atleast four of five installations

(c) A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25 cm and standard deviation 1.16cm?

(d) The sizes and means of two independent random samples are 400, 225, 3.5 and 3 respectively . Can we conclude that the samples are drawn from the same population with standard deviation 1.5?

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

(f) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal rule.

(g) Find by Taylor's series method, the values of y at $x = 0.1$ and $x = 0.2$ to five places of decimals from $\frac{dy}{dx} = x^2y - 1$; $y(0) = 1$.

(h) Find an approximate value of y when $x = 0.2$ given that $\frac{dy}{dx} = x + y$ and $y(0) = 1$ using Runge-Kutta fourth order method.

PART B

(4x15=60)

II. (a) The random variable X is normally distributed with mean 9 and standard deviation 3. Find the probability for (i) $X \geq 15$ (ii) $X \leq 15$ (iii) $0 \leq X \leq 9$. (6)

(b) Form the two regression equations for the following data. Also find the coefficient of correlation between x and y. (9)

x	36	23	27	28	28	29	30	31	33	35
y	29	18	20	22	27	21	29	27	29	28

OR

III. (a) Determine the constants 'a' and 'b' by the method of least squares such that $y = ae^{bx}$ fits the following data. (8)

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.63

(b) The number of death reported of people of age more than 100yrs. on 1000 days were noted. (7)

No. of deaths reported	0	1	2	3	4	5	6	7	8
No. of days	229	325	257	119	50	17	2	1	0

Fit a Poisson distribution and calculate the theoretical frequencies.

IV. (a) The specification for a certain kind of ribbon call for a mean breaking strength of 180 pounds. If five pieces of the ribbon have a mean breaking strength of 169.5 pounds with a standard deviation of 5.7 pounds, test the null hypothesis $\mu = 180$ pounds against the alternative hypothesis $\mu < 180$ pounds at 0.01 level of significance. (8)

(b) A random sample is taken from a normal population with mean 30 and S.D 4. How large a sample should be taken if the sample mean is to lie between 25 and 35 with probability 0.98? (7)

OR

V. (a) In a large lot of electric bulbs, the mean life and S.D of the bulbs are 360 hrs. and 90 hrs. respectively. A sample of 625 bulbs is chosen. It is found that mean life and S.D of the bulbs in the sample are 355 hrs. and 90 hrs. respectively. Can we conclude that the sample is drawn from the given population test at 5% level of significance if we assume that the population is normal and its mean is unknown. Also find the 98% confidence limits of the mean. (8)

(b) The lapping process which is used to grind certain silicon wafers to the proper thickness is acceptable only if 'σ', the population S.D of the thickness of the dice cut from the wafer is atmost 0.50 ml. Use 0.05 level of significance to test $H_0 : \sigma = 0.5$ against $H_1 : \sigma > 0.5$, if the thickness of 15 dice cut from such wafers have a S.D of $0.04ml$. (7)

VI. (a) Find the cubic polynomial which takes the following values $y(0)=1;\ y(1)=0;\ y(2)=1;\ y(3)=10$. Hence obtain $y(4)$. (6)

(b) Using Newton's divided difference formula find the values of $f(2), f(8)$ and $f(15)$ for the following data. (9)

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

OR

VII. (a) From the given data find the value of x when $y = 13.5$. (6)

x	93.0	96.2	100	104.2	108.7
y	11.38	12.80	14.70	17.07	19.91

(b) From the following table obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.2$. (9)

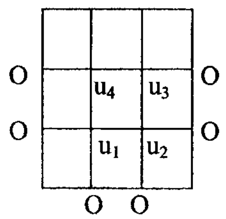
x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

VIII. (a) Using modified Euler's method find an approximate value of y when $x = 0.3$ given that $\frac{dy}{dx} = x + y$ and $y(0) = 1$. (9)

(b) Solve the equation $y'' = x + y$ with boundary condition $y(0) = y(1) = 0$.. (6)

OR

IX. (a) Solve the equation $U_{xx} + U_{yy} = 0$ in the following domain using Jacobi's methods. (8)



(b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the condition $u(x,0) = Sin\pi x, 0 \le x \le 1;\ u(0,t) = u(1,t) = 0$. Carryout the computations for two levels. Take $h = \frac{1}{3}$ and $k = \frac{1}{36}$. (7)

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