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BTS(C) – V – 10 – 049 – A

B. Tech Degree V Semester Examination November 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) Given that $f(x) = Kx^4 e^{-x}; 0 < x < \infty$ is a p.d.f. Determine the value of K.

(b) If X follows Poisson distribution with $P[X=2] = \frac{2}{3} P[X=1]$. Then find $P[X=3]$.

(c) A random sample size 36 is taken from a normal population with sd. 3. Find the probability that the sample mean exceeds the population mean by atleast one.

(d) Let a random sample of size 17 from normal distribution $N(\mu, \sigma^2)$ yield $\overline{x} = 4.7$, $S^2 = 5.76$. Determine a 90%. C.I for μ.

(e) Prove that $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$.

(f) Compute the value of $\int_4^{5.2} \log x \, dx$ using Simpson's' $1/3^{rd}$ rule.

(g) Solve $\frac{dy}{dx} = x + y$; $y(0) = 1$ at $x = .2$ using Taylor's series method.

(h) Solve $xy'' + y = 0$ with boundary conditions $y(1) = 1$ and $y(2) = 2$.

(4 x 15 = 60)

PART - B

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

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

OR

III. (a) Find the rank correlation coefficient for the following data.

X :	75	58	70	70	45	45	45	30	29	40
Y :	64	42	65	56	39	56	50	50	25	39

(10)

(b) If the regression equation between X and Y are $4x - 5y + 33 = 0$ and $20x - 9y = 107$. Find the correlation coefficient and means of the variable. (5)

IV. (a) A random sample of size 10 taken from $N(\mu, \sigma)$ has $S = 4$. Find a and b such that $P\left[a \le \sigma^2 \le b\right] = .95$ (7)

(b) An engineer is making engine parts with axle diameter .7 inches and s.d of .04 inches. A random sample of 10 parts shown a mean of .742 inches. Test the hypothesis. $H_0 : \mu = .7$ V_s $H_1 : \mu \ne .7$ at 5% level of significance. (8)

OR

(P.T.O)

V. (a) A continuous random variable X has a frequency function $f(x) = \frac{1}{\theta}; 0 < x < \theta$. It is desired to test $H_0 : \theta = 1 \; V_s \; H_1 : \theta = 2$ using a single observation X and $X \geq .95$ is used as critical region. Evaluate probability of type I and II errors. (6)

(b) Two independent random sample of size $n = 10,\; u_2 = 7$ were observed to have sample variances $S_1^{\,2} = 16,\; S_2^{\,2} = 3$. Using $\alpha = .01$. Test $H_0 : \sigma_1^{\,2} = \sigma_2^{\,2} \; V_s$ $H_1 : \sigma_1^{\,2} \neq \sigma_\alpha^{\,2}$. (9)

VI. (a) Find the second difference of the polynomial $f(x) = x^4 - 12x^3 + 42x^2 - 30x + 9$ with $h = 2$. (7)

(b) Calculate $f(1.02)$ from the following table. (8)

x :	1	1.1	1.2	1.3	1.4
f(x) :	.8415	.8912	.932	.9636	.9855

OR

VII. (a) Prove that $e^x = \left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{E\,e^x}{\Delta^2 e^x}$; the interval of differencing being h. (7)

(b) Find $f'(.6)$ and $f''(.6)$ from the following data. (8)

x :	.4	.5	.6	.7	.8
y :	1.58	1.8	2.64	2.33	2.65

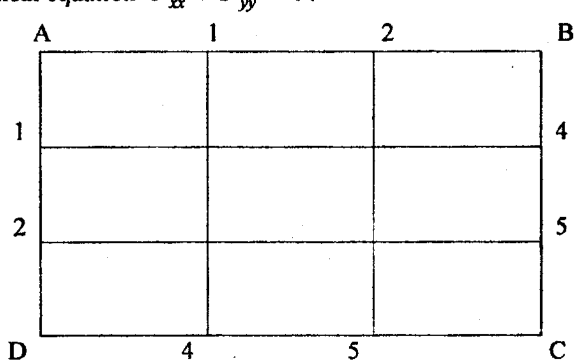
VIII. (a) Find by Runge Kutta method, an approximate value of y for $x = .2$ in steps of $.1$ if $\frac{dy}{dx} = x + y^2$; $y(0) = 1$. (7)

(b) Solve $U_{xx} - 2\,U_t = 0$ given $u(0,t) = 0,\, u(4,t) = 0,\; u(x,0) = x(4 - x)$. Assume $h = 1$. Find the values of U upto $t = 5$. (8)

OR

IX. (a) Apply Euler's method to solve $\frac{dy}{dx} = \frac{y - x}{y + x}; y(0) = 1$ at $x = .1$. (7)

(b) Solve the elliptical equation $U_{xx} + U_{yy} = 0$.



(8)

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