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BTS-V(15)-11.17-1518 Reg. No.

B

B.Tech. Degree V Semester Examination November 2017

CE/CS/EC/EE/IT/ME/SE
AS 15-1501 NUMERICAL AND STATISTICAL METHODS
(2015 Scheme)

Time : 3 Hours Maximum Marks : 60

PART A
(Answer *ALL* questions)

(10 × 2 = 20)

I. (a) Show that $\Delta^3 y_0 = y_3 - 3y_2 + 3y_1 - y_0$. (1+1)

(b) Find the cubic polynomial $y(x)$ such that $y(0)=1, y(1)=0, y(2)=1$ and $y(3)=10$, hence find $y(4)$. (½+½+½+½)

(c) Find the third divided difference with arguments 2, 4, 9, 10 where $f(x)=x^3-2x$. (1+1)

(d) A curve is passing through $(0,4),(2,8),(4,15),(6,7)$ and $(8,6)$. Find its slope at $x=1$. (½+½+½+½)

(e) Develop a general polynomial for numerical integration. (1+1)

(f) Define the following. (½+½)

(i) Random variable (ii) Sample space (iii) Mathematical expectation.

(g) Check whether $f(x)=\begin{cases} e^{-x}, & x\geq 0 \\ 0, & x<0 \end{cases}$ is a probability density function or not. (1+1)

(h) The probabilities of Poisson variate taking the values 3 and 4 are equal. Calculate the probabilities of the Poisson variate taking the value 1. (½+1+1)

(i) Write normal equations when fitting the straight line $y=ax^2+bx+c$. (1+1)

(j) Define (i) Critical region (ii) Significance level and (iii) Power of the test. (1+½+½)

PART B

(4 × 10 = 40)

II. (a) By using Newton Raphson's method find the real root of $x^4-x-10=0$, correct to three decimal places. (1+2+1+1+1)

(b) Solve the system of equations by Gauss-Siedel method.
$8x+y+z=8,\ 2x+4y+z=4,\ x+3y+5z=5$. (1+1+1+1+1+1)

OR

III. (a) The population of a town in the census is given below. Examine the population for the year 1896. (1+1+2+1)

Year	1891	1901	1911	1921	1931
Population in thousands	46	66	81	93	101

(b) Using the following table, find $f(x)$ as a polynomial by Newton's formula (2+2+1)

x	-1	0	3	6	7
y	3	-6	39	122	1611

IV. (a) Find $f^{11}(1.6)$ from the following table.

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.829	8.403	8.781	9.129	9.451	9.750	10.031

(b) Using Simpson's $\frac{1}{3}rd$ rule, evaluate $\int_0^1 \frac{dx}{1+x^2}$, taking $h=\frac{1}{4}$.

OR

V. (a) Consider the initial value problem $\frac{dy}{dx}=xy,\ y(0)=1$. Find $y(0.4)$ by Euler's method.

(b) Using Runge-Kutta method of second order, solve

$\frac{dy}{dx}=x-2y,\ y(0)=1$ at $x=0.1, 0.2$.

VI. (a) Six coins are thrown simultaneously. Find the probability of getting at least four heads.

(b) For a binomial distribution, prove that mean = np and variance = npq.

OR

VII. (a) Prove that Poisson distribution as the limiting case of Binomial distribution.

(b) Fit a curve $y=ae^{bx}$ for the points $(1, 10), (5, 15), (7, 12), (9, 15), (12, 21)$.

VIII. (a) The mean breaking strength of a certain kind of metallic rope is 160 pounds. If six pieces of ropes (randomly selected from different rolls) have a mean breaking strength of 154.3 pounds with standard deviation 6.4 pounds, test the null hypothesis $\mu<160$ pounds at 1% l.o.s. Assume that population follows normal distribution.

(b) The mean values of birth rate with standard deviations and sample sizes are given below by Socio-economic status. Is the mean difference in birth weight significant between Socio-economic groups?

	High Socio-economic group	Low Socio-economic group
Sample size	$n_1=15$	$n_1=10$
Birth weight in kg	$\bar{x}=2.91$	$\bar{y}=2.26$
Standard deviation	$S_1=0.27$	$S_2=0.22$

OR

IX. (a) Test the null hypothesis that $\sigma=0.022$ inch for the diameters of certain wire rope against the alternative hypothesis $\sigma\neq 0.022$ inch. Given that a random sample of size 18 yielded $S^2=.000324$.

(b) The standard deviation of a sample size 15 from a normal population was found to be 7. Examine whether the hypothesis that the S.D is 7.6 is acceptable.

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