END TERM EXAMINATION

FOURTH SEMESTER [BCA] MAY-JUNE 2012

Paper Code: BCA202 **Subject: Mathematics-IV**

Time : 3 Hours **Maximum Marks :75**

Note: Q.no.1 is compulsory. Attempt one question from each unit.

Q1 (a) In a single throw of two dice, find the probability of getting a total of 9. **(2)**

(b) Find n if P(n,2)=72. **(2)**

(c) Let y=f(x) and a, a+h, a+2h,... be consecutive values of x. Define the operations Δ and E as $\Delta f(x) = f(x+h) - f(x)$, $Ef(x) = f(x+h)$. Show that $E = I + \Delta$ and $E\Delta = \Delta E$. Where I denotes the identity operator. **(3)**

(d) The sum and product of the mean and variance of a binomial distribution are 24 and 128. Find the distribution. **(3)**

(e) Let X be a Poisson variate. If $P(X=0) = P(X=1)$ find E(X), the expectation of X. **(3)**

(f) (i) Correlation coefficient is the .... Mean of the regression coefficient.

(ii) Regression coefficients are .....of the change of origin but .... of scale. **(3)**

(g) Form a forward difference table of the function f:R→R defined as $f(x) = x^3 - 4x^2 - 5x + 1$ for x=0,1,2,3,4; R denoting the set of all real numbers. Find $\Delta^4 f(0)$. **(3)**

(h) Prove that $\Delta(\log_e f(x)) = \log_e \left[1 + \frac{\Delta f(x)}{f(x)}\right]$ where Δ denotes the forward difference operator. **(3)**

(i) Evaluate $\int_0^4 e^x dx$ by using Simpson's one-third rule by dividing the range [0,4] into 4 equal parts using e=2.72, e^2=7.39, e^3=20.09 and e^4=54.6 . **(3)**

UNIT-I

Q2 (a) Let A and B be two events such that $P(A) = \frac{3}{4}$ and $P(B) = \frac{5}{8}$. Show that $\frac{3}{8} \le P(A \cap B) \le \frac{5}{8}$. **(6.5)**

(b) Let A and B be two events such that $P(A) = \frac{5}{10}$ and $P(B) = \frac{8}{10}$. Find the conditional probabilities $P(A/B)$ and $P(B/A)$. **(6)**

Q3 (a) Find the number of ways in which 4 red, 3 black and 2 yellow balls can be arranged in a row. **(6)**

(b) Given $C(48,12) + C(48,13) + C(49,14) = C(50,x)$. Find x. Here C(n,r) denotes the number of ways in which r objects can be chosen out of n distinct objects. **(6.5)**

UNIT-II

Q4 (a) Let X be a binomial variate with mean 4 and variance $\frac{4}{3}$. Find $P(X \ge 1)$. **(6)**

(b) Let X be a Poisson variate. If $P(X=2) = 9P(X=4) + 90P(X=6)$ show that E(X)=1, E(X) denoting the expectation of X.

P.T.O.

Q5 (a) The lines of regression of y on x and x on y are 4x-5y+33=0 and 20x-9y-107=0 respectively. Determine the means $\bar{x}, \bar{y}$ and the coefficient of correlation between x and y. **(6.5)**

(b) By using the normal equations, fit a parabola $Y=aX^2+bX+C$, $a\neq 0$, to the following data: **(6)**

x	0	1	2	3	4
y	1	5	10	22	38

UNIT-III

Q6 (a) Let y=f(x) and a, a+h, a+2h,....be the consecutive values of x. Define the operators Δ and ∇ as $\Delta f(x) = f(x+h) - f(x)$ *and* $\nabla f(x) = f(x) - f(x-h)$. Prove that

(i) $\Delta\nabla = \nabla\Delta = \Delta - \nabla$ (ii) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$. **(6)**

(b) Find a root of the equation $x^3-4x-9=0$ by using the bisection method in four stages. **(6.5)**

Q7 (a) Given the data: **(6)**

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

Find y(1) and y(10).

(b) Given the data-

x	2	4	9	10
f(x)	4	56	711	980

Find the polynomial f(x) by using Newton's divided difference formula. **(6.5)**

UNIT-IV

Q8 (a) Find the LU decomposition of the matrix $A=\begin{pmatrix} 3 & 2 & 7 \\ 2 & 3 & 1 \\ 3 & 4 & 1 \end{pmatrix}$. **(6)**

(b) Using Gauss Elimination method, solve the following system of linear equations. **(6.5)**

$$x+y+z=9$$
$$2x-3y+4z=13$$
$$3x+4y+5z=40.$$

Q9 (a) Using Jacobi's iteration method, solve the following system of linear equations:

$$20x+y-2z=17,\ 30x+20y-z=-18,\ 2x-3y+20z=25,$$

Hint: Start with $x_0=0$, $y_0=0$, $z_0=0$ to get the first iteration (x_1,y_1,z_1), obtain the 5th and 6th iterations and conclude the approximate solution. **(6.5)**

(b) Given the data-

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\left(\frac{dy}{dx}\right)_{x=1.1}$ and $\left(\frac{d^2y}{dx^2}\right)_{x=1.1}$ by using Newton's forward formula of interpolation. **(6)**

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