

**END TERM EXAMINATION****FOURTH SEMESTER [BCA] MAY 2018****Paper Code: BCA-202****Subject: Mathematics-IV****Time: 3 Hours****Maximum Marks: 75**

**Note: Attempt any five questions including Q.no.1 which is compulsory.  
Select one question from each unit.**

**Q1 Attempt any ten Parts:- (2.5x10=25)**

- From a pack of 52 cards, two are drawn at random. What is the probability that one is a king and the other a queen?
- A grade school boy has 5 blue and 4 white marbles in his left pocket and 4 blue and 5 white marbles in his right pocket. If he transfers one marble from his left pocket to right pocket, what is the probability of his then drawing a blue marble from his right pocket?
- A coin is tossed three times. What is the probability of occurrence of head and tail alternately?
- Show that
  - $\delta = E^{1/2} + E^{-1/2}$
  - $\Delta = \nabla E$
- A can solve 75% of the problems and B can solve 70% of the problems. What is the probability that either A or B can solve problem chosen at random?
- Find the value of K so that the following function is a probability density function  $f(x) = \frac{k}{1+x^2}, -\infty < x < \infty$ .
- For any positive integers r and  $n > r$ , prove that
 
$$\binom{n-1}{r-1} + \binom{n-1}{r} = \binom{n}{r}$$
- Using Lagrange's interpolation find the interpolation polynomial for the function  $y(x)$  for the given values below.

$x$	0	3	4
$y(x)$	-12	6	8

- Find two successive approximation of a real roots of the equation  $f(x) = x^3 - x - 1 = 0$  by using Bisection method.
- A fire insurance company has 3,840 policyholders. If the probability is  $1/1200$  that any one of the policyholders will file atleast one claim in any given year. Find the mean of the distribution.
- Prove that for any two events A and B
 
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

**Unit-I**

- Q2**
- A coin is tossed until a head appears. What is the expectation of the number of tosses? (3.5)
  - A perfect cube die is thrown a large number of times in a set of 8. The occurrence of 5 or 6 is called a success. What is probability of exactly 3 success? (3.5)
  - Out of  $(2n+1)$  tickets consecutively numbered, three are drawn at random. What is the probability that the numbers on them are in arithmetic progression (A. P.)? (5.5)

**P.T.O.**

- Q3 (a) Find the probability that at most 5 defective fuses will be found in a box of 200 fuses if experience show that 2% of such fuses are defective. (3.5)
- (b) The four attendants A, B, C and D of a company are supposed to wash the windshield of each customer's car. A, who service 20% of all cars, fails to wash the windshield one time in 20; B, who services 60% of all cars, fails to wash the windshield one time in 10; C, who services 15% of all cars, fails to wash the windshield one time in 10; and D, who services 5% of all cars, fails to wash the windshield one time in 20. If a customer complains later that his windshield was not washed, what is the probability that his car was serviced by A? (3.5)
- (c) Out of 3n consecutive number 3 numbers are selected at random. What is the probability that their sum is divisible by 3? (5.5)

## Unit-II

- Q4 (a) Prove that the Binomial distribution reduces to Poisson distribution under the conditions that the number of trial  $n$  is very large and the probability of success  $p$  is small such that  $np = \lambda$ , a constant. (6.5)
- (b) If  $X$  is normally distributed with mean 2 and variance 1. Find  $P[|X - 2| < 1]$ . (6)
- Q5 (a) Find the moment generating function of Binomial distribution of random variable  $X$ . Hence find its mean and variance. (6.5)
- (b) It has been claimed that in 60% of all solar heat installations utility bill is reduced by atleast one-third. Accordingly, what are the probability that the utility bill will be reduced by at least one-third in
- (i) four of five installation; (2)
- (ii) at least four of five installation? (4)

## Unit-III

- Q6 (a) Find a real root of the equation  $f(x) = x^3 - 2x - 5 = 0$  correct to 3 decimal places using method of False position. (6)
- (b) From the following table of value of  $x$  and  $f(x)$ .

$X$	0.20	0.22	0.24	0.26	0.28	0.30
$f(x)$	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

Determine the value of  $f(0.23)$  and  $f(0.29)$ . (6.5)

- Q7 (a) Find a real root of the equation  $x = e^{-x}$  using **Newton-Raphson method** with an accuracy of  $10^{-3}$ . (6)
- (b) Give the table of values

$x$	150	152	154	156
$y = \sqrt{x}$	12.247	12.329	12.410	12.490

Evaluate  $\sqrt{155}$  using Lagrange's interpolation and estimate the error. (6.5)

## Unit-IV

Q8 (a) Consider the system of equations:

$$x_1 + x_2 + x_3 = 3$$

$$2x_1 + 3x_2 + x_3 = 6$$

$$x_1 - x_2 - x_3 = -3$$

Find the inverse of the coefficient matrix of the above system of equations by Gauss-Jordan method. (6.5)

(b) A rocket is launched from the ground. Its acceleration  $a(t)$  measured in every 5 seconds is tabulated below.

t	0	5	10	15	20	25	30
a(t)	40.0	46.50	49.25	52.25	55.75	58.25	60.50

Find the velocity of the rocket at  $t = 30$  second using Simpson's 1/3 rule. (6)

Q9 (a) Solve the system of equations:

$$2x_1 - 2x_2 + x_3 = 2$$

$$5x_1 + x_2 - 3x_3 = 0$$

$$3x_1 + 4x_2 + x_3 = 9$$

Using LU decomposition method. (6.5)

(b) From the following table find the value of  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at the point  $x = 1.5$ . (6)

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.000	13.625	24.000	38.875	59.000

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