

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)

- (a) 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?
- (b) 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 transfer one marble from his left pocket to right pocket, what is the probability of his then drawing a blue marble from his right pocket?
- (c) A coin is tossed three times. What is the probability of occurrence of head and tail alternately?
- (d) Show that
 - (i) $\delta = E^{1/2} + E^{-1/2}$
 - (ii) $\Delta = \nabla E$
- (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?
- (f) Find the value of K so that the following function is a probability density function $f(x) = \frac{k}{1+x^2}, -\infty < x < \infty$.
- (g) For any positive integers r and n>r, prove that

$$\binom{n-1}{r-1} + \binom{n-1}{r} = \binom{n}{r}$$
- (h) 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

- (i) Find two successive approximation of a real roots of the equation $f(x) = x^3 - x - 1 = 0$ by using Bisection method.
- (j) 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.
- (k) 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) A coin is tossed until a head appears. What is the expectation of the number of tosses? (3.5)
 - (b) 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)
 - (c) 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)

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- 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)**

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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
