Bankim Sardar College

Semester IV Examination

B.Sc. Gen

Subject: Mathematics

Paper: CC4 / GE4

Answers of each group should be in separate answer-sheet

Group – A (F.M. 10)

Answer any <u>five</u> questions 5×2

1. (i) Let $A = \{1, 2, 3\}, B = \{1, 0, -1\}$ and $C = \{2, 3\}$. Find $(A \cap B) \times C$.

(ii) Fill in the blank: $(1573)_8 = (?)_2$.

(iii) Write the FORTRAN expression of $x^y sec^{-1}x$.

(iv) Express the vector $(7, 11) \in R^3$ as a linear combination of the vectors $(2, 3)$ and $(3, 5)$.

(v) If A and B are independent events then prove that $P(A) + P(B) = 1$.

(vi) A random variable x has the probability density function

$$f(x) = \begin{cases} cx^2, when\ 0 \le x \le 1 \\ 0, otherwise. \end{cases}$$

Find the value of c.

(vii) Find the mean of Poisson distribution.

$(viii)$ A fair die is thrown, write down the sample space and find the probability of odd numbers will turn up.

Group – B (F.M. 15)

2. (i) Find the median of the numbers $11, 22, 33, 55, 66, 99$. 2

Or

Give an example of a mapping $f: Z \to Z$, which is injective but not surjective.

(ii) A box contains 8 black balls and 4 white balls. If 5 balls are drawn at random find the probability that 3 of them are black and 2 white. 3

Or

Let $J = -6, M = 2$ and $N = 8$. Compute the value of the FORTRAN expression: $(M + N)/J + M$

(iii) Find the standard deviation of the numbers $4, 8, 10, 12, 16$. 3

Or

Does the set $\{-2, -1, 0, 1, 2\}$ form a group under addition? – Justify your answer.

(iv) Define the coefficient of correlation r between the two variables x and y. 2

Or

Write the full form of RAM and ROM.

(v) For any two events A and B, prove that $P(AB) \le P(A) + P(B)$. 3

Or

Find a basis of R^3 containing the vector $(1, 2, 3)$.

(vi) On what basis computers can be classified? 2

Or

What is mathematical expectation?

Group – C (F.M. $65 = 25 \times 1 + 4 \times 10$)

Choose the correct answer

3. (i) Pictorial representation of data using symbols is known as

(a) Bar graph (b) Pictograph (c) Pie chart (d) None of the these.

(ii) Double bar graphs display _____ sets of data simultaneously

(a) 4 (b) 3 (c) 2 (d) 1.

(iii) _____ gives the number of times a particular entry occurs

(a) Organisation data (b) Collection of data (c) Representation of data (d) Frequency

(iv) A bag has 4 red balls and 5 white balls two balls are drawn at random what is the probability that one is red and one is white

(a) $\frac{5}{9}$ (b) $\frac{1}{4}$ (c) $\frac{4}{9}$ (d) $\frac{2}{9}$.

(v) Which of following is not a random experiment?

(a) Tossing a coin (b) Rolling a dice (c) Choosing a card from a pack of 52 cards

(d) Throwing a stone from the roof.

(vi) In Pie chart the total angle at the centre of the circle is

(a) 90^0 (b) 180^0 (c) 270^0 (d) 360^0.

(vii) What is the probability of getting a sum of 9 from two throws of a dice?

(a) $\frac{1}{6}$ (b) $\frac{1}{8}$ (c) $\frac{1}{9}$ (d) $\frac{1}{12}$.

$(viii)$ In a Binomial distribution if n is the number of trials and p is the probability of success then the mean is

(a) np (b) npq (c) p (d) n.

(ix) It is suitable to use Binomial distribution only for

(a) Large value of n (b) Small values of n (c) any value of n

(d) only when n is greater than 30 and less than 100.

(x) For large value of n, Binomial distribution

(a) loses its discreteness (b) tends to Poisson distribution (c) gives oscillatory values

(d) stay as it is.

(xi) In a Normal distribution

(a) mean = median only (b) median = mode only (c) mean = median = mode (d) mean = mode only.

(xii) The mean of Poisson distribution with parameter m is

$(a)\ m$ $(b)\ \sqrt{m}$ $(c)\ \sqrt[3]{m}$ $(d)\ \frac{1}{m}$.

$(xiii)$ Number of elements in a power set of $A = \{0, 1, 2, 3\}$ is

(a) 8 (b) 12 (c) 16 (d) 32.

(xiv) Let '*' be a binary operation, defined by $a * b = 2a + b - 3$. The value of $3 * 4$ is

(a) 7 (b) 6 (c) 8 (d) 4.

(xv) Brain of a computer system is

(a) ALU (b) CU (c) MU (d) CPU.

(xvi) _____ is a step by step process for solving a problem.

(a) Flow chart (b) Pseudocode (c) Algorithm (d) All of these.

$(xvii)$ Which of the following is a low-level programming language?

(a) Java (b) Python (c) Machine Language (d) Ada.

$(xviii)$ What is the full form of FORTRAN?

(a) FORmula TRANslation (b) FORmula TRANscription (c) FORmula TRANsition

(d) FORmulation TRANslation

(xix) Program in which language be both compiled and interpreted during execution

(a) FORTRAN (b) BASIC (c) C (d) Java.

(xx) The value of $2 ** (5/3)$ is

(a) 10.67 (b) 2 (c) 3.17 (d) 3.

(xxi) 1 TB equals to

(a) 2^{10} bytes (b) 2^{20} bytes (c) 2^{30} bytes (d) 2^{40} bytes.

$(xxii)$ Which one of the following memories is used to store data permanently?

(a) Primary memory (b) Secondary memory (c) Cache memory (d) CPU Registers.

$(xxiii)$ If R be a ring such that $a^2 = a, \forall\ a \in R$, then $a + a =$

(a) $2a$ (b) a (c) $-a$ (d) 0.

$(xxiv)$ In a flow chart a computation (process) is represented by a

(a) Circle (b) Rhombus (c) Rectangle (d) Parallelogram.

(xxv) The value of $(-2.0) ** 2.0$ is

(a) 4.0 (b) 4 (c) 1.0 (d) ABSURD.

Answer any four questions

4. (a) State and prove Bayes Theorem in probability. 5

(b) What is the chance that a leap year selected at random will contain 53 Sundays? 5

5. (a) Draw a Pie Chart to represent the following data on the proposed outlay of the fifth five-years plan 5

Fifth five-years plan (in crores rupees)

Agriculture	Rs.12,000
Irrigation and power	Rs. 5,000
Industries	Rs. 8,000
Education	Rs. 9,000
Road and communication	Rs. 6,000

(b) Find the median and mode from the following table: 5

Age	:	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 - 60
Frequency	:	5	70	100	130	150	120	70	60

6. (a) Distinguish between population and a sample. What is a random sample? Describe some method of drawing such a sample from a finite population. 5

(b) 10 Life Insurance Policies in a sample of 200 taken out of 50,000 were found to be insured for less than Rs. 5,000. How many policies can be reasonably expected to be insured for less than Rs. 5,000 in the whole total 95% confidence level? 5

7. (a) What is meant by a test of a Null Hypothesis? What are type I and type II errors? 5

(b) Explain the concepts of Confidence Interval, Confidence Limit and Confidence Coefficient. 5

8. (a) Let Q be the set of rational numbers. An operation '*' is defined by $a * b = a + b + ab, \forall a, b \in Q$. Examine whether $(Q,*)$ is a group or not. 5

(b) Define a sub-ring of a ring $(R, +, \bullet)$. Check whether $\{2n, n \in Z\}$ is a sub-ring of the ring $(Z, +, \bullet)$ of integers. 5

9. (a) Draw a flow chart to find the sum of 10 natural numbers.

(b) Write an efficient algorithm to test whether a given natural number is divisible by 3 but not by 9. 5

10. (a) Evaluate (using 2's complement method): $(1010011.01)_2 - (1000101.11)_2$. 5

(b) Evaluate the octal arithmetic: $(576)_8 + (116)_8 - (477)_8$. 5

11. (a) Let S be a subset of R^3 defined by $S = \{(x, y, z) \in R^3 : x^2 + y^2 = z^2\}$. Then examine if S is a subspace of R^3. 5

(b) Use Cayley-Hamilton theorem to compute the inverse of the matrix $\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$. 5