Second Semester B.Sc. (Hon's) Mathematics Degree (CBCSS – OBE – Regular/Supplementary/Improvement) Examination, April 2024
(2021 Admission Onwards)
Core Course
2B06 BMH : DISTRIBUTION FUNCTIONS AND COMBINATORICS

Time : 3 Hours

Max. Marks : 60

PART – A

Answer **any four** questions from this Part. **Each** question carries **1** mark : **(4×1=4)**

1. Describe Binomial distribution.

2. Give any two example of Poisson variate.

3. What is the moment generating function of Normal distribution ?

4. Find ϕ (23100).

5. Find a generating function for the sequence $1^2, 2^2, 3^2, ...$

PART – B

Answer **any six** questions from this Part. **Each** question carries **2** marks : **(6×2=12)**

6. Find mean of Poisson distribution.

7. Define rectangular distribution and find its mean.

8. Give any four properties of Normal curve.

9. Write the probability density function of the distribution with moment generating function $M_x(t) = (0.4e^t + 0.6)^8$.

10. X is Normally distributed with mean 20 and standard deviation 5. Find $P(X \geq 23)$.

P.T.O.

11. If eight district dice are rolled, what is the probability that all six numbers appear ?

12. Determine the number of positive integer n, $(1 \leq n \leq 2000)$ that are not divisible by 2, 3 or 5.

13. How many integer solutions are there for the equation $c_1 + c_2 + c_3 + c_4 = 20$, $0 \leq c_i \leq 7$ for all $1 \leq i \leq 4$?

14. If a die is rolled 12 times, what is the probability that the sum of the roll is 30 ?

PART – C

Answer **any eight** questions from this Part. **Each** question carries **4** marks : **(8×4=32)**

15. If $X \sim B (n, p)$. Prove $\mu_{r+1} = pq \left[nr\mu_{r-1} + \dfrac{d\mu_r}{dp} \right]$.

16. A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. Calculate proportion of days on which

   a) neither car is used, and

   b) some demand is refused.

17. A horizontal line of length 5 cm is divided by a point chosen at random into two parts. If the length of the first part is X. Find $E(X(5 - X))$ and moment generating function X.

18. For a Normal distribution with mean μ and variance σ^2, show that $\mu_{2k} = 1 \times 3 \times ... \times (2k - 1) \sigma^{2k}$.

19. Let X follows a geometric distribution with parameter p, show that for any two positive integers s and t, $P(X > s + t | X > s) = P (X > t)$.

20. For a Normal population 31% of the items are under 45 and 8% are over 64. Find mean and standard deviation.

21. Find the number of permutations of a, b, c, ..., x, y, z in which none of the patterns spin, game, path, or net occurs.

22. How many onto functions are there from a set with six elements to a set with three elements ? Explain using inclusion-exclusion principle.

23. Derive the rook polynomial for the standard 8 × 8 chessboard. Generalize your formula for the standard n × n chessboard, for $n \in Z^+$.