BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, NOVEMBER 2024
2017, 2018, 2019, 2020, 2021, 2022 ADMISSIONS SUPPLEMENTARY
SEMESTER III - COMPLEMENTARY COURSE 2 (STATISTICS)
PY3CMT09 - Statistical Methods and Elementary Probability

Time : 3 Hours

Maximum Marks : 80

Part A

I. Answer any Ten questions. Each question carries 2 marks　　　　(10x2=20)

1. Define sure event.

2. Define equally likely events.

3. Write examples for finite sample space and infinite sample space.

4. A problem is given to three students A, B and C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. Find the probability that none of them will solve the problem.

5. Define distribution function of a random variable.

6. Write down the properties of probability density function of a random variable.

7. Define mathematical expectation of a random variable.

8. If $p(x) = \begin{cases} \frac{x}{15} & \text{if } x = 1, 2, 3, 4, 5. \\ 0, & \text{elsewhere.} \end{cases}$

   Find P(X =1 or 2).

9. Define standard normal distribution.

10. Write down about the symmetry of a standard normal distribution with the diagram.

11. Write down E(x) of a normal distribution and standard normal distribution.

12. Obtain the mean and variance of the given normal distribution.

   $$f(x) = \frac{1}{2\sqrt{2\pi}} e^{-\frac{(x-10)^2}{8}} \quad, -\infty < x < \infty$$

Part B

II. Answer any Six questions. Each question carries 5 marks　　　　(6x5=30)

13. Distinguish between independent and dependent events with examples.

14. Two cards are drawn from a deck of 52 playing cards. Obtain the probability that (i) Both are hearts (ii) Both are queens (iii) One is from spade and the other is from diamond.

15. A bag contains 6 red, 5 white and 4 black balls. If two balls are drawn at random obtain the probability that (i) One is red and the other is black (ii) None of them is red (iii) One is black and the other is white.

16. Distinguish between probability density function and distribution function of a random variable.

17. Distinguish between discrete and continuous random variables with examples.

18. If X is a random variable with the following probability mass function. Obtain (i) $P(X \leq 0)$ (ii) $P(1 \leq X \leq 8)$ (iii) P(X is odd)

x	-3	-1	0	1	2	3	5	8
p(x)	0.10	0.20	0.15	0.05	0.25	0.15	0.05	0.05

19. Distinguish between normal and standard normal distributions.

20. Explain the situation where a binomial distribution arises.

21. The probability of a man hitting a target is 1/3. If he fires 6 times obtain (i) The probability of his hitting the target at least twice (ii) The probability that he doesn't hit the target (iii) Obtain the mean and variance.

Part C

III. Answer any Two questions. Each question carries 15 marks (2x15=30)

22. State and prove addition theorem of probability for any two events and also for any three events.

23. (i) An integer is chosen at random from 1 to 200. Obtain the probability that the integer is divisible by 6 or 8. (ii) Three newspapers A, B and C are published in a certain city. It is estimated from a survey that : 20% read A, 16% read B, 14% read C, 8% read both A and B, 5% read both A and C, 4% read both B and C, 2% read all three. Obtain that percentage read at least one of the newspapers.

24. (i) Obtain the mean and variance of the following distribution.

x	1	2	3	4	5	6
p(x)	0.10	0.15	0.20	0.25	0.18	0.12

(ii) obtain the mean and variance of (3x+2) and (3x-2)

(iii) Obtain the distribution function.

25. X is normally distributed with mean 50 and standard deviation 20. Obtain the probability that

(i) $X \leqslant 30$

(ii) $0 \leqslant X \leqslant 40$

(iii) $X \geqslant 55$

(iv) $X > 45$.