

B.A. (Honours) Examination, 2019

Semester–II

Economics

Course – H-4

(Quantitative Methods-I)

(For Back Candidates)

Time: Three Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Answer **any four** questions.

1. (a) For any two events A and B, prove that $P(A+B) \leq P(A)+P(B)$
(b) When two events are said to be mutually exclusive? Prove that for events A and B (neither of which is impossible), if $P(AB)=P(A).P(B)$, then they are not mutually exclusive. 4+2+4=10
2. (a) Suppose A, B and C are three events which are mutually exclusive and exhaustive. The probability of event B is twice that of event A. Again, probability of events C is twice that of event B. Find the probability of event A.
(b) If an unbiased coin is tossed 3 times, what is the probability of the following events?
(i) getting at least one head
(ii) getting head in the first toss, followed by tails in the next two tosses. 4+3+3=10
3. (a) A team of 4 students are selected randomly out of 6 boys and 4 girls. What is the probability that the team consists of (i) no girl and (ii) at least one girl?
(b) A bag contains 50 tickets numbered 1 to 50. Five tickets are selected at random and then the selected tickets are arranged in increasing order of their number. What is the probability that the third number is 25 after such arrangement? 5+5=10
4. (a) State and prove Bayes' Theorem.
(b) A box contains 2 white and 4 black balls. Another box contains 3 white and 3 black balls. A ball is chosen randomly from the first box and transferred to the second box. After the transfer, one ball is chose randomly from the second box. What is the probability that it is black? 6+4=10
5. (a) If x is a discrete random variable and k is an arbitrary constant, then show that

$$E(kx)=kE(x)$$

P.T.O.

(2)

- (b) A continuous random variable x has the following probability density function:

$$\begin{aligned}f(x) &= x; & 0 \leq x < 1 \\&= k - x; & 1 \leq x < 2 \\&= 0 & \text{elsewhere}\end{aligned}$$

Find the value of 'k' and hence find the cumulative distribution function for x .

4+6=10

6. (a) What is a Bernoullian series of trials? Derive the formula for x success in a Bernoullian series of 10 trials with probability of success in each trial being 0.5.
- (b) In a factory, every box of finished product contains 200 toys. On an average, there are 3 percent defective toys. What is the probability that a randomly selected box will have no defective toys in it? [$e^{-6} = 0.00248$]
- 6+4=10
7. (a) Suppose x is a discrete random variable which follows Poisson distribution such that $P(x = 0) = P(x = 1)$. Find the probability of x having a non-zero value.
- (b) Find the mode of a binomial distribution.
- 4+6=10
8. (a) A type of non-rechargeable dry battery cell is found to have an average life of 12 hours with a standard deviation of 3 hours. Assuming a normal distribution of battery life, find the probability that such a battery will last for over 15 hours [given $\phi(1) = 0.8413$].
- (b) Show that the probability that the number of heads in 400 tosses of a fair coin lies between 180 and 220 is approximately equal to $(2\phi(2) - 1)$, where $\phi(x)$ stands for the c.d.f. of standard normal distribution.
- 5+5=10
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