

B.A. (Honours) Examination, 2018
Semester-II
Economics
Paper- H-4 (Old Syllabus)
(Quantitative Methods- I)

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 $P(AB) = P(A) \cdot P(B/A) = P(B) \cdot P(A/B)$
(b) When two events are said to be independent? Prove that if two events (neither of which are impossible) are mutually exclusive, then they are not independent. 4+2+4=10
2. (a) One card is drawn randomly from a full pack of cards. What is the probability that it is a Heart or a Queen?
(b) There are 5 black and 2 white balls in a box. Two balls are drawn from it successively without replacement. What is the probability of the following events?
(i) One is black and the other is white
(ii) First one is black and the second one is white 4+6
3. (a) A team of 4 persons are selected randomly out of 7 men and 4 women. What is the probability that the team consists of (i) no woman and (ii) at least one woman?
(b) A bag contains 50 tickets numbered 1 to 50. Five tickets are selected at random and then the obtained 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) Three households have the following gender composition of members:
Household 1 = 4 Men 2 Women
Household 2 = 3 Men 3 Women
Household 3 = 2 Men 4 Women
One household is selected at random (with equal chance) and after that one member is selected at random from it. The member turns out to be a woman. What is the probability that she belonged to the 3rd Household? 5+5=10
5. (a) A person gains or losses an amount equal to the number appearing when a balanced die is rolled once, depending on whether the number is even or odd. What is the expected gain of the person in the game?
(b) A continuous random variable x has the following probability density function:
$$f(x) = cx^2, \quad \text{for } 0 \leq x \leq 1$$
$$= 0 \quad \text{otherwise}$$
Find the value of 'c' and hence find the cumulative distribution function. 5+5=10
6. (a) What is a Bernoullian series of trials? Find the probability of x success in a Bernoullian series of n trials with a probability of success p in each trial.
(b) A machine produces 10% defective item on an average. Suppose 10 items are picked up randomly from the production line of that machine. Find the probability of getting not more than one defective items in the sample. 6+4=10

P.T.O.

(2)

7. (a) The probability that a Poisson variate x takes a non-zero value is $(1 - e^{-2})$. Find the probability that x is less than 2.
- (b) Find the mode of a Poisson distribution. 4+6=10
8. (a) 5000 candidates appeared at an examination in which the pass marks (out of 100) is 40. The average score obtained by the candidates is 43 with a standard deviation of 7. Estimate the number of candidates who (i) have passes but didn't get more than 50 and (ii) have scored 50 or above. [assume normal distribution. Given $\phi(0.43) = 0.6664$ and $\phi(1) = 0.8413$].
- (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 $(2 \cdot \phi(2) - 1)$, where $\phi(x)$ stands for the c.d.f. of standard normal distribution 5+5=10
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