

B.A. (Honours) Examination, 2015

Semester – II

Economics

Paper : H-4

(Quantitative Methods I)

Time: 3 Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Answer **any four** questions.

1. (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
2. (a) When two events are said to be statistically independent? Prove that two events (none of which are impossible events) are *not* independent if they are mutually exclusive and they are *not* mutually exclusive if they are independent.
(b) The probability that a teacher will take a surprise test in any day is $1/5$. If a student is absent on two days, what is the probability that he will miss at least one test?

5+5
3. (a) In a toy manufacturing company toys are being packaged in two automated lines of production. At the end of each line, packed toys are put into boxes containing 100 toys in each box. In the first line, 10% of the packaging is defective. But it produces 600 such boxes per day. The second line produces 200 boxes per day but with only 5% defective packaging. At the end of a day one box is selected at random and one toy is selected from it. What is the probability that it will have a defective packaging?
(b) State and prove Bayes' Theorem.

5+5
4. (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:
$$f(x) = cx^2, \text{ for } 0 \leq x \leq 1$$
$$= 0 \text{ otherwise}$$

Find the value of 'c' and hence find the cumulative distribution function.

5+5

P.T.O.

5. (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) In an infinite series of Bernoulli trials with a probability of success p in each trial, find the probability of x failures preceding the first success. Also find the expected value of x . 5+5
6. (a) For a binomial distribution, the mean and S.D. are 4 and $\sqrt{3}$ respectively. Find the probability of getting a non-zero value for this distribution.
- (b) Suppose x denotes the number of heads in a throw of nine unbiased coins. Describe the distribution of x and find its mode. 4+6
7. (a) The probability that a Poisson variate x takes a non-zero value is $(1 - e^{-2})$. Find the probability that x lies within the interval $(-1, 1.5)$
- (b) Derive the raw moment generating function for a Poisson distribution and hence find its mean and variance. 4+6
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 $(2\Phi(2) - 1)$, where $\Phi(x)$ stands for the c.d.f. of standard normal distribution. 5+5
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