

B.A. (Honours) Examination, 2015

Semester-VI

Economics

Course – H.13

(Quantitative Methods- II)

Time: 3 Hours

Full Marks: 40

Questions are of value as indicated in the margin.

Answer **any four** questions

1. (a) The letters A,B,C,D and E are arranged randomly in a line. What is the probability that

(i) Letters C and D will appear together in the order mentioned?

(ii) There will be no letters between C and D?

- (b) A card is drawn at random from a full pack. Events A, B and C are defined as follows:

Event A = the drawn card is red in colour

Event B = the drawn card is a 'Heart'

Event C = the drawn card is a 'King'

Examine the pair wise dependence or independence of the events A, B and C.

4+6=10

2. (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) The sex composition in four households are as follows:

Household 1 = 3 Men 2 Women

Household 2 = 2 Men 3 Women

Household 3 = 2 Men 4 Women

Household 4 = 4 Men 2 Women

One household is selected at random 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 4th Household?

4+6=10

3. (a) 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.

- (b) Derive the moment generating function of a Poisson distribution and hence find its mean and variance (use usual notations).

5+5=10

P.T.O.

4. (a) In 8 independent trials of a random experiment with a constant probability of success in each trial, it is known that the probability of 5 successes is exactly equal to the probability of 3 successes. If the experiment is repeated 6 times, what is the probability of getting exactly 4 successes?
- (b) 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 passed but didn't get more than 50 and (ii) have scored 50 or above. [assume normal distribution. Given $\Phi(0.43) = 0.6664$ and $\Phi(1) = 0.8413$]. 5+5=10
5. Two ideal dice are thrown. Let X_1 be the score on the first die and X_2 the score on the second die. Let Y denote the maximum of X_1 and X_2 .
- (i) Write down the joint distribution of Y and X_1 .
- (ii) Find the mean and variance of Y . 7+3=10
6. Consider a population of size N and drawing of a random sample of size n under the SRSWOR scheme. Find out the mean and variance of sample mean. 3+7=10
7. (a) Explain the following: 5
- (i) Null hypothesis and alternative hypothesis
- (ii) One tailed test and two tailed test
- (iii) Critical region
- (iv) Level of Significance
- (v) Type I and Type II error
- (b) A member of a public interest group concerned with environmental pollution asserts at a public hearing that 'fewer than 60% of the industrial plants in this area are complying with air pollution standards'. Attending this meeting is an official of the pollution authority who believes that 60% of the plants are complying with the standards. For conducting a thorough search, the official samples 60 plants from a population of over 10,000 plants and finds that 33 are complying with air pollution standard. Is the assertion by the official ratio valid one? (Consider $\alpha = 0.01$). 5
8. (a) What is a chain index? Discuss its advantages and disadvantages relative to a fixed based index number. 2+3
- (b) Discuss how you will proceed for constructing a cost of living index number for the middle class people in Kolkata. 5
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