

B.A. (Honours) Examination, 2017
Semester-II
Economics
Course: 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) Arrange the following probabilities in increasing order of magnitude:

$$P(A), P(B), P(A \cup B), P(AB),$$

with proper justification, where A and B are two events and A is subset of B. 6

- b) Consider the Experiment that A coin is tossed and then a six-faced die is thrown and the number appearing uppermost is noted. For this Experiment write down the Sample Space and find the probability that the number appearing uppermost is less than or equal to five. 2+2
2. a) State and prove Theorem of Total Probability (m.e. case). 2+3
- b) State and prove Addition Theorem of Probability. 2+3
3. a) State Bayes' Theorem. 2
- b) Consider two urns, one containing a_1 white balls, b_1 red balls and c_1 black balls and the other containing respectively a_2 , b_2 and c_2 balls. Suppose one ball is chosen randomly from the first urn and is put into the second one and then one ball is drawn randomly from the second urn. Find the conditional probability that the ball chosen from the first urn is white given that the ball drawn from the second one is white. 5
- c) Show that two events are independent iff their complements are independent. 3
4. a) Define the distribution function (d.f.) of a r.v.X. 2
- b) Write down the properties of the d.f. referred in (a). 4
- c) Draw (free hand) the graph of the distribution function of a r.v. taking values 1,2,3 with equal probabilities. 4
5. a) Find the mean and the variance of a Binomial variate. 5
- b) Show that the mean and the variance of a Poisson variate are equal. 5

6. For a continuous r.v. X ,

- a) Define the probability density function (p.d.f.) of X . 2
- b) Obtain the expression of $P(a < X < b)$ in terms of the p.d.f. of X , where a and b are real numbers and $a < b$. 3
- c) When the range of X is the open interval $(0,1)$ and the p.d.f. of X , $f(x)$, is:

$$f(x) = 1, \text{ if } 0 < x < 1$$

$$0, \text{ otherwise,}$$
 Find $P((1/3) < X < (2/3))$. 5

7. For a r.v. $X \sim N(\mu, \sigma^2)$,

- a) Find the distribution of $Y = a + bX$, where a and b are real numbers and $b \neq 0$ (the fact that “a linear function of a normal variate is also a normal variate” may be used). 5
- b) Using a). or otherwise, find out the distribution of $(X - \mu) / \sigma$ 5
- 8. a) In the context of the joint distribution of two random variables X and Y , what do you mean by the marginal distribution of X ? 1
- b) Given the joint distribution of two random variables X and Y (both discrete), how will you derive the marginal distributions of X and Y ? 6
- c) Under what condition, given the marginal distributions of X and Y , it is possible to obtain the joint distribution of X and Y – explain. 3
