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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech II Semester End Examinations (Regular) - May, 2017

Regulation: IARE – R16

PROBABILITY AND STATISTICS

(Common for CSE/IT)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) A random variable x has the density function [7M]

$$P(x) = \begin{cases} kx^2, & -3 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

i. Evaluate K

ii. $P(1 \leq x < 2)$

iii. $P(x \leq 2)$

- (b) The savings bank account of a customer showed an average balance of Rs.150 and a standard deviation of Rs. 50. Assuming the account balances are normally distributed, find what percentage of account is. [7M]

i. Over Rs.200

ii. Between Rs.120 and Rs.170

iii. less than Rs.75

2. (a) A recent study by a marketing research firm showed that 15% of the homes had a video recorder for recording TV programs. A sample of 200 homes is obtained. (Let X be the number of homes). What is the probability that less than 40 homes in the sample have video recorders? What is the probability that more than 24 homes in the sample have video recorders [7M]

- (b) A continuous random variable X has the distribution function [7M]

$$f(x) = \begin{cases} 0, & \text{if } x \leq 1 \\ k(x-1)^4, & 1 \leq x \leq 3 \\ 1, & x > 3 \end{cases} \quad \text{Determine}$$

i. k

ii. Mean

UNIT – II

3. (a) A fair coin is tossed thrice. The random variables X and Y are defined as follows: $X = 0$ or 1 according as head or tail occurs on the first toss. $Y =$ Number of heads [7M]

i. Determine the distributions of X and Y

ii. Determine Joint distribution of X and Y.

- (b) Find the correlation coefficient from the following data [7M]

X	1	2	3	4	5	6	7	8	9	10
Y	10	12	16	28	25	36	41	49	40	50

4. (a) If X and Y are continuous random variables having the Joint density function, [7M]

$$f(x, y) = \begin{cases} c(x^2 + y^2), & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

Determine c

- (b) The following data gives the age of husband (x) and the age of wife (y) in years. Find the correlation coefficient. [7M]

X	36	23	27	28	28	29	30	31	33	35
Y	39	18	20	22	27	21	29	27	29	28

UNIT – III

5. (a) A population consists of 4 numbers 3,7,11,15. If N, n denotes respectively the population size and sample size σ and σ_x respectively denotes population S.D and S.D of the sampling distribution of means consider all the possible samples of size 2 that can be drawn without replacement, Verify that [7M]

i. $\sigma_x^2 = \frac{\sigma^2}{n} \left[\frac{N-n}{N-1} \right]$

ii. $\mu_x = \mu$ where μ_x is the mean of this distribution and μ is population mean.

- (b) If the mean of an infinite population is 575 with standard deviation of 8.3 how large a sample must be used in order that there be one chance in 100 that the mean of the sample is less than 572? [7M]

6. (a) Discuss about type-I and Type –II errors in hypothesis testing [7M]

- (b) Explain Different types of sampling techniques [7M]

UNIT – IV

7. (a) The scores on an aptitude test required for entry into a certain job position have a mean of 500 and a standard deviation of 120. If a random sample of 36 applicants has a mean of 546, is there evidence that their mean score is different from the mean that is expected from all applicants? [7M]

- (b) An oil company claims that less than 20% of all car owners have not tried its gasoline. Test this claim at the 0.01 level of significance, if a random check reveals that 22 out of 200 car owners have not tried the oil company's gasoline. [7M]

8. (a) The mean of two large samples of 1000 and 2000 members are 168.75 cm and 170 cms respectively can the samples be regarded as drawn from the same population of standard deviation 6.25 cm. Test at 1% Level of significance [7M]

- (b) The failure rate of typhoid patient is believed to be 17.26%. In a certain year, 640 patients suffered from typhoid were treated in a metropolitan hospital and only 63 patients died. Can you consider the hospital efficient? Test at 1% Level of significance. [7M]

UNIT – V

9. (a) Discuss about F distribution and its properties. [7M]
- (b) It is believed that the precision of an instrument is no more than 0.16. test the belief at 1% Level of significance based on the following measurements, 2.3, 2.4, 2.3, 2.5, 2.7, 2.5, 2.6, 2.6, 2.7, 2.5, 2.5 [7M]
10. The heights of six randomly chosen sailors are in inches : 63, 65, 68, 69, 71, 72. Those of 10 randomly chosen soldiers are 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Test, if sailors are on the average taller than soldiers [14M]