INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

MODEL QUESTION PAPER

B.Tech II Semester End Examinations (Regular), May – 2018
Regulation: IARE–R16
PROBABILITY AND STATISTICS
(Common to 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) Prove that the Poisson distribution is a limiting case of Binomial distribution.   **[7M]**
   (b) If the probability density function of Random variable $f(x) = k(1 - x^2), 0 < x < 1$ then find
       (i)k(ii)P$[0.1 < x < 0.2]$(iii)P$[x > 0.5]$.   **[7M]**

2. (a) A random variable X has the following probability function:

X	-2	-1	0	1	2	3
P(X)	0.1	K	0.2	2K	0.3	K

   Then find (i) K (ii) mean (iii) variance (iv) P$(0 < x < 3)$ **[7M]**
   (b) In a Normal distribution, 7 percent of the items are under 35 and 89 percent are under 63. Find the mean
       and standard deviation of the distribution   **[7M]**

UNIT II

3. (a) Find joint probability density function of two random variables x and y where joint distribution function
   is $F(x, y) = \begin{cases} (1 - e^{-x^2})(1 - e^{-y^2}), x > 0, y > 0 \\ 0, \ Otherwise \end{cases}$ and also find P$(1 \leq x \leq 2, 1 \leq y \leq 2)$.   **[7M]**
   (b) Calculate the coefficient of correlation from the following data

x	12	9	8	10	11	13	17
y	14	8	6	9	11	12	13

   [7M]

4. (a) Find the angle between the two regression lines.   **[7M]**
   (b) A sample of 12 fathers and their elder sons gave the following data about their elder sons.Calculate the
       coefficient of rank correlation.

Fathers	65	63	67	64	68	62	70	66	68	67	69	71
Sons	68	66	68	65	69	66	68	65	71	67	68	70

   [7M]

UNIT III

5. (a) Samples of size 2 are taken from the population 1, 2, 3, 4, 5, 6 Which can be drawn with replacement.
       Find i) The mean of the population. ii) The standard deviation of the population. iii) The mean of the
       sampling distribution of means. iv) The standard deviation of the sampling distribution of means.   **[7M]**
   (b) A random sample of 400 items is found to have mean 82 and standard deviation of 18. Find the maximum
       error of estimation at 95 percent confidence interval. Find the confidence limits for the mean if $\bar{x} = 82$ **[7M]**

6. (a) Among 100 fish caught in a large lake, 18 were inedible due to the pollution of the environment. With what confidence can we assert that the error of this estimate is at most 0.065? **[7M]**

   (b) If the population is 3, 6, 9, 15, 27
      i. List all possible samples of size 3 that can be taken without replacement from the finite population.
      ii. Calculate the mean of each of the sampling distribution of means.
      iii. Find the standard deviation of sampling distribution of means. **[7M]**

UNIT IV

7. (a) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of Standard deviation 2.5 inches. **[7M]**

   (b) In a random sample 125 cool drinkers 68 said that they prefer thumsup to pepsi. Test the null hypothesis P=0.5 against the alternative hypothesis P > 0.5 at 5 percent level of significance. **[7M]**

8. (a) A sample of 400 items is taken from a population whose standard deviation is 10.The mean of sample is 40.Test whether the sample has come from a population with mean 38 also calculate 95 percent confidence interval for the population. **[7M]**

   (b) Random sample of 400 men and 600 women were asked whether they would like to have flyover near their residence. 200 men and 325 women were in favour of proposal. Test the hypothesis that the proportion of men and women in favour of proposal are same at 5 percent level **[7M]**

UNIT V

9. (a) A random sample of 10 boys had the following I.Q's 70,120,110,101,88,83,95,98,107,100. Do the data support the assumption of population means I.Q of 100. Test at 5 percent level of significance? **[7M]**

   (b) The following is the distribution of the hourly number of trucks arriving at a company wear house

Trucks per hour	0	1	2	3	4	5	6	7	8
frequency	52	151	130	102	45	12	3	1	2

   Fit a Poisson distribution to the following table and test the goodness of fit at 0.05 level. **[7M]**

10. (a) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins. The sample standard deviation of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, Test the hypothesis that the true variances are equal. **[7M]**

    (b) Three training methods were compared to see if they led to greater productivity after training. The productivity measures for individuals trained by different methods are as follows

Method 1	36	26	31	20	34	25
Method 2	40	29	38	32	39	34
Method 3	32	18	100	21	33	27

    At the 0.05 level of significance, do the three training methods lead to difference levels of productivity? **[7M]**

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COURSE OBJECTIVES:

The course should enable the students to:

1	Enrich the knowledge of probability on single random variables and probability distributions.
2	Apply the concept of correlation and regression to find covariance.
3	Analyze the given data for appropriate test of hypothesis.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

CAHS011.01	Understand the basic concepts of probability and random variables.
CAHS010.02	Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.
CAHS010.03	Use the concept of random variables in real-world problem like graph theory, machine learning, Natural language processing.
CAHS010.04	Apply the binomial distribution and poisson distribution to find mean and variance.
CAHS010.05	Understand binomial distribution to the phenomena of real-world problem like sick versus healthy.
CAHS010.06	Use poission distribution in real-world problem to predict soccer scores.
CAHS010.07	Apply the inferential methods relating to the means of normal distributions.
CAHS010.08	Understand the mapping of normal distribution in real-world problem to analyze the stock market.
CAHS010.09	Explain multiple random variables and the covariance of two random variables.
CAHS010.10	Understand the concept of multiple random variables in real-world problems aspects of wireless communication system.
CAHS010.11	Calculate the correlation coefficient to the given data.
CAHS010.12	Understand the correlation and regression to the real-world such as stock price and interest rates.
CAHS010.13	Calculate the regression to the given data.
CAHS010.14	Understand the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean.
CAHS010.15	Understand the concept of estimation for classical inference involving confidence interval.
CAHS010.16	Understand the concept of estimation in real-world problems of signal processing.
CAHS010.17	Understand the foundation for hypothesis testing.
CAHS010.18	Understand the concept of hypothesis testing in real-world problem to selecting the best means to stop smoking.
CAHS010.19	Apply testing of hypothesis to predict the significance difference in the sample means.
CAHS010.20	Apply testing of hypothesis to predict the significance difference in the sample proportions.
CAHS010.21	Apply Student t-test to predict the difference in sample means.
CAHS010.22	Apply F-test to predict the difference in sample variances..
CAHS010.23	Understand the characteristics between the samples using Chi-square test.

CAHS010.24	Understand the assumptions involved in the use of ANOVA technique.
CAHS010.25	Understand the concept ANOVA to the real-world problems to measure the atmospheric tides.
CAHS010.26	Understand the concepts and acquired the knowledge for attempting the competitive exams.

Mapping of Semester End Examinations to Course Learning Outcomes:

SEE Question No.			Course Learning Outcomes	Blooms Taxonomy Level
1	a	CAHS010.04	Apply the binomial distribution and poisson distribution to find mean and variance.	Remember
	b	CAHS010.02	Analyze the concepts of discrete and continuous random variables, probability distributions,expectation and variance.	Understand
2	a	CAHS010.02	Analyze the concepts of discrete and continuous random variables, probability distributions,expectation and variance.	Understand
	b	CAHS010.07	Apply the inferential methods relating to the means of normal distributions.	Remember
3	a	CAHS010.09	Explain multiple random variables and the covariance of two random variables.	Remember
	b	CAHS010.11	Calculate the correlation coefficient to the given data.	Understand
4	a	CAHS010.13	Calculate the regression to the given data.	Understand
	b	CAHS010.11	Calculate the correlation coefficient to the given data.	Understand
5	a	CAHS010.14	Understand the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean.	Understand
	b	CAHS010.15	Understand the concept of estimation for classical inference involving confidence interval.	Understand
6	a	CAHS010.15	Understand the concept of estimation for classical inference involving confidence interval.	Understand
	b	CAHS010.14	Understand the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean.	Understand
7	a	CAHS010.19	Apply testing of hypothesis to predict the significance difference in the sample means.	Remember
	b	CAHS010.20	Apply testing of hypothesis to predict the significance difference in the sample proportions.	Remember
8	a	CAHS010.19	Apply testing of hypothesis to predict the significance difference in the sample means.	Remember
	b	CAHS010.20	Apply testing of hypothesis to predict the significance difference in the sample proportions.	Remember
9	a	CAHS010.21	Apply Student t-test to predict the difference in sample means.	Remember
	b	CAHS010.23	Understand the characteristics between the samples using Chi-square test.	Understand
10	a	CAHS010.22	Apply F-test to predict the difference in sample variances.	Remember
	b	CAHS010.24	Understand the assumptions involved in the use of ANOVA technique.	Understand