Hall Ticket No | | | | | | | | | | | Question Paper Code: AHSB12

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech III Semester End Examinations, November - 2019

Regulations: R18

PROBABILITY AND STATISTICS

(Common to AERO/MECH)

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

MODULE – I

1. a) What is the definition of probability and conditional probability? **[7M]**
   b) A continuous random variable has the probability density function **[7M]**

$$f(x)=\begin{cases} kxe^{-\lambda x}, \ for\ x\geq 0, \lambda>0 \\ 0, otherwise \end{cases}$$

Determine (i) k (ii) Mean (iii) Variance.

2. a) Define the term mathematical expectation of a probability distribution function **[7M]**
   b) Two coins are tossed simultaneously. Let X denotes the number of heads then find i) E(X) ii) $E(X^2)$ iii)$E(X^3)$ iv) V(X). **[7M]**

MODULE – II

3. a) Explain about Normal distribution **[7M]**
   b) The average number of phone calls per minute coming into a switch board between 2 P.M. and 4 P.M. is 2.5. Determine the probability that during one particular minute (i) 4 or fewer calls (ii) more than 6 calls. **[7M]**

4. a) Define the term mode of a Binomial distribution **[7M]**
   b) The mean weight of 500 male students at a certain college is 75kg and the standard deviation is 7kg. Assuming that the weights are normally distributed find how many students weight (i) Between 60 and 78 kg (ii) more than 92kg **[7M]**

MODULE – III

5. a) Define multiple regressions **[7M]**
   b) Calculate the Karl Pearson's coefficient of correlation from the following data. **[7M]**

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

6. a) Write the difference between correlation and regression **[7M]**

b) A random sample of 5 college students is selected and their grades in mathematics and statistics are found to be **[7M]**

	1	2	3	4	5
Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

Calculate Spearman's rank correlation coefficient.

MODULE – IV

7. a) Define standard error of a statistic **[7M]**

b) A population consists of 5, 10, 14, 18, 13, 24. Consider all possible samples of size two which can be drawn without replacement from this population. Find **[7M]**

i) The mean of the population.

ii) The standard deviation of the population.

iii) The mean of the sampling distribution of means.

The standard deviation of the sampling distribution of means

8. a) Write the test statistic for difference of means in large samples. **[7M]**

b) A random sample of size 64 is taken from a normal population with μ =51.4 and σ =68. **[7M]**

What is the probability that the mean of the sample will

i) exceed 52.9 ii) fall between 50.5 and 52.3 iii) be less than 50.6.

MODULE – V

9. a) What is the degree of freedom for t test for difference of means? **[7M]**

b) Two independent samples of items are given respectively had the following values. **[7M]**

Sample I	11	11	13	11	15	9	12	14
Sample II	9	11	10	13	9	8	10	-

Test whether there is any significant difference between their means?

10. a) Write a short note on Distinguish between t test for difference of means and F test. **[7M]**

b) Fit a poisson distribution to the following data and test the goodness of fit at 0.05 level. **[7M]**

x	0	1	2	3	4	5	6	7
frequency	305	366	210	80	28	9	2	1

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COURSE OBJECTIVES:

The course should enable the students to:

I	Enrich the knowledge of probability on single random variables and probability distributions.
II	Apply the concept of correlation and regression to find covariance.
III	Determine mean and variance of given data by sampling distribution.
IV	Analyze the given data for appropriate test of hypothesis.

COURSE OUTCOMES (COs):

CO 1	Describe the concept of probability, conditional probability, Baye's theorem and analyze the concepts of discrete, continuous random variables
CO 2	Determine the binomial, poisson and normal distribution to find mean, variance.
CO 3	Understand multiple random variables and enumerate correlation and regression to the given data.
CO 4	Explore the concept of sampling distribution and apply testing of hypothesis for sample means and proportions.
CO 5	Use t-test for means, F-test for variances and chi-square test for independence to determine whether there is a significant relationship between two categorical variables.

COURSE LEARNING OUTCOMES (CLOs):

AHSB12.01	Describe the basic concepts of probability.
AHSB12.02	Summarize the concept of conditional probability and estimate the probability of event using Baye's theorem.
AHSB12.03	Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.
AHSB12.04	Use the concept of random variables in real-world problem like graph theory; machine learning, Natural language processing.
AHSB12.05	Determine the binomial distribution to find mean and variance.
AHSB12.06	Understand binomial distribution to the phenomena of real-world problem like sick versus healthy.
AHSB12.07	Determine the poisson distribution to find mean and variance.
AHSB12.08	Use poisson distribution in real-world problem to predict soccer scores.
AHSB12.09	Illustrate the inferential methods relating to the means of normal distributions.
AHSB12.10	Describe the mapping of normal distribution in real-world problem to analyze the stock market.
AHSB12.11	Explain multiple random variables and the covariance of two random variables.
AHSB12.12	Understand the concept of multiple random variables in real-world problems aspects of wireless communication system.

AHSB12.13	Calculate the correlation coefficient to the given data.
AHSB12.14	Contrast the correlation and regression to the real-world such as stock price and interest rates.
AHSB12.15	Calculate the regression to the given data.
AHSB12.16	Discuss the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean.
AHSB12.17	Understand the foundation for hypothesis testing.
AHSB12.18	Summarize the concept of hypothesis testing in real-world problem to selecting the best means to stop smoking.
AHSB12.19	Apply testing of hypothesis to predict the significance difference in the sample means.
AHSB12.20	Apply testing of hypothesis to predict the significance difference in the sample proportions.
AHSB12.21	Use Student t-test to predict the difference in sample means.
AHSB12.22	Apply F-test to predict the difference in sample variances.
AHSB12.23	Understand the characteristics between the samples using Chi-square test.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AHSB12.02	Summarize the concept of conditional probability and estimate the probability of event using Baye's theorem	CO 1	Understand
	b	AHSB12.03	Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.	CO 1	Understand
2	a	AHSB12.03	Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.	CO 1	Understand
	b	AHSB12.03	Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.	CO 1	Understand
3	a	AHSB12.09	Illustrate the inferential methods relating to the means of normal distributions	CO 2	Understand
	b	AHSB12.05	Determine the binomial distribution to find mean and variance.	CO 2	Remember
4	a	AHSB12.09	Illustrate the inferential methods relating to the means of normal distributions	CO 2	Understand
	b	AHSB12.09	Illustrate the inferential methods relating to the means of normal distributions	CO 2	Understand
5	a	AHSB12.15	Calculate the regression to the given data	CO 3	Understand
	b	AHSB12.11	Explain multiple random variables and the covariance of two random variables	CO 3	Understand
6	a	AHSB12.13	Calculate the correlation coefficient to the given data	CO 3	Understand
	b	AHSB12.13	Calculate the correlation coefficient to the given data.	CO 3	Understand
7	a	AHSB12.16	Discuss the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean	CO 4	Understand
	b	AHSB12.16	Discuss the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean	CO 4	Understand
8	a	AHSB12.16	Discuss the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean	CO 4	Understand

	b	AHSB12.17	Understand the foundation for hypothesis testing.	CO 4	Understand
9	a	AHSB12.21	Use Student t-test to predict the difference in sample means.	CO 5	Understand
	b	AHSB12.21	Use Student t-test to predict the difference in sample means.	CO 5	Understand
10	a	AHSB12.22	Apply F-test to predict the difference in sample variances.	CO 5	Understand
	b	AHSB12.23	Understand the characteristics between the samples using Chi-square test.	CO 5	Understand

Signature of Course Coordinator **HOD, AE**