

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER -II

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) | Define the discrete and continuous random variables with a suitable example | [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]</x<0.2]> | [7M] |
| 2. | a) | Define the term Mean and Variance of a probability density function. | [7 M] |

b) Three boxes, practically indistinguishable in appearance have two drawers each. Box 1 [7M] contains a gold coin in first and silver coin in the other drawer, Box 2 contains a gold coin in each drawer and Box 3 contains a silver coin in each drawer. One box is closed at random and one of its drawers is opened at random and a gold coin is found. What is the probability that the other drawer contains a coin of silver?

MODULE – II

| 3. a) | | Prove that the Poisson distribution is a limiting case of Binomial distribution. | | |
|-------|----------|---|--------------|--|
| | 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 weigh I) Between 60 and 78 kg ii) more than 92kg. | [7M] | |
| 4. | a) b) | Define the terms Mean, Variance of Poisson distribution The variance and mean of a binomial variable X with parameters n and p are 4 and 3. | [7M] [7M] | |

MODULE – III

Find i) P(X=1) ii) $P(X \ge 1)$ iii) $P(0 \le X \le 3)$.

| 5. a) Write the properties of rank correlation coefficient | [7M] |
|--|------|
|--|------|

b) In the following table S is weight of Potassium bromide which will dissolve in 100 grms. [7M] Of water at V°C. fit an equation of the form S=mT+b by the method of least squares. Use this relation to estimate S when $T=50^{\circ}$.

| Т | 0 | 20 | 40 | 60 | 80 |
|---|----|----|----|----|----|
| S | 54 | 65 | 75 | 85 | 96 |

- 6. a) What is the regression equation of X_1 on X_2 and X_3 ?
 - b) Give the following data compute multiple coefficient of correlation of X_3 on X_1 and X_2 . [7M]

[7M]

| X_1 | 3 | 5 | 6 | 8 | 12 | 14 |
|----------------|----|----|----|----|----|----|
| X_2 | 16 | 10 | 7 | 4 | 3 | 2 |
| X ₃ | 90 | 72 | 54 | 42 | 30 | 12 |

MODULE – IV

- 7. Explain different types and classification of sampling [7M] a) A cigarette manufacturing firm claims that brand A line of cigarettes outsells its brand B [7M] b) by 8% .if it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B. Test whether 8% difference is a valid claim. 8. a) Distinguish between large and small samples with example [7M] b) A sample of 900 members has mean of 3.4 and S.D of 2.61 is this sample has been taken [7M]
 - b) A sample of 900 members has mean of 3.4 and S.D of 2.61 is this sample has been taken [7M] from a large population mean 3.25 and S.D 2.61. Also calculate 95% confidence interval.

MODULE – V

- 9. a) A sample of 26 bulbs gives a mean life of 990 hrs with S.D of 20hrs. The manufacturer [7M] claims that the mean life of bulbs 1000 hrs. Is the sample not upto the standard?
 - b) In one sample of 8 observations the sum of squares of deviations of the sample values from the sample mean was 84.4 and another sample of 10 observations it was 102.6 .test whether there is any significant difference between two sample variances at at 5% level of significance
- a) What is the test statistic for F test? [7M]
 b) From the following data, find whether there is any significant liking in the habit of taking [7M]

| soft drinks among the categories of employees. | | | | | | | | |
|--|--------|----------|----------|--|--|--|--|--|
| Soft drinks | Clerks | Teachers | officers | | | | | |
| Pepsi | 10 | 25 | 65 | | | | | |
| Thumsup | 15 | 30 | 65 | | | | | |
| Fanta | 50 | 60 | 30 | | | | | |



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COURSE OBJECTIVES:

The course should enable the students to:

| Ι | 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 | а | 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 |
| | a | AHSB12.03 | Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance. | CO 1 | Understand |
| 2 | b | AHSB12.03 | Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance. | CO 1 | Understand |
| | a | AHSB12.05 | Determine the binomial distribution to find mean and variance | CO 2 | Understand |
| 3 | b | AHSB12.09 | Illustrate the inferential methods relating to the means of normal distributions | CO 2 | Remember |
| 4 | а | AHSB12.07 | Determine the poisson distribution to find mean and variance. | CO 2 | Understand |
| 4 | b | AHSB12.05 | Determine the binomial distribution to find mean and variance. | CO 2 | Understand |
| 5 | а | AHSB12.11 | Explain multiple random variables and the covariance of two random variables | CO 3 | Understand |
| 3 | b | AHSB12.11 | Explain multiple random variables and the covariance of two random variables | CO 3 | Understand |
| 6 | а | AHSB12.15 | Calculate the regression to the given data | CO 3 | Understand |
| 0 | 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 | AHSB12.18 | Summarize the concept of hypothesis testing in real- world problem to selecting the best means to stop smoking | CO 4 | Understand |
| 8 | а | AHSB12.20 | Apply testing of hypothesis to predict the significance difference in the sample proportions. | CO 4 | Understand |

| | b | AHSB12.20 | Apply testing of hypothesis to predict the significance difference in the sample proportions. | CO 4 | Understand |
|----|---|-----------|---|------|------------|
| 0 | а | AHSB12.21 | Use Student t-test to predict the difference in sample means. | CO 5 | Understand |
| 9 | b | AHSB12.22 | Apply F-test to predict the difference in sample variances. | CO 5 | Understand |
| 10 | а | 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