Hall Ticket No | | | | | | | | | | | Question Paper Code: AHSD11

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech III Semester End Examinations, SEPTEMBER – 2024

Regulation: BT23

PROBABILITY AND STATISTICS

COMPUTER SCIENCE ENGINEERING

Time: 3 hour | Max Marks: 60

Answer ALL Questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE-I

1. (a) A committee consists of 9 students 2 of which are from 1st year, 3 from second year and 4 from third year. Three students are to be removed at random. What is the chance that (i) The three students belong to different classes. (ii) Two belong to the same class and third to the different class. (iii) The three belong to the same class.
[BL: Apply|CO: 1|Marks:6M]

   (b) Three boxes contains: 3 red, 4 white and 1 blue; 1 red, 2 white and 3 blue balls; 4 red, 3 white, and 2 blue balls. One box is chosen at random and a ball is withdrawn it happens to be red. What is the probability that it come from box two.
[BL: Apply|CO: 1|Marks:6M]

MODULE-II

2. (a) Outline the concept of random variables. Let X denotes the minimum of the two numbers that appear when a pair of fair dice is thrown once. calculate the (i) Expectation (ii) Variance. [BL: Understand|CO: 2|Marks:6M]

   (b) The function $f(x) = Ax^2$, in 0< x<1 is valid probability density function then Calculate the value of A. [BL:Apply|CO: 2|Marks:6M]

MODULE-III

3. (a) Out of 20 tape recorders 5 are defective. Find the standard deviation of defective in the sample of 10 randomly chosen tape recorders. Find (i) P(X=0) (ii) P(X=1) (iii) P(X=2) (iv) P (1<X<4). [BL: Apply|CO: 3|Marks:6M]

   (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. [BL: Apply|CO: 4|Marks:6M]

4. (a) Derive the median of the Normal distribution and Explain the properties of normal distribution. [BL: Understand|CO: 4|Marks:6M]

(b) If 7% of the students scored marks less than 35 and 11% of the students scored above 63 marks calculate the mean and variance assuming normality.

[BL: Apply|CO: 4|Marks:6M]

MODULE-IV

5. (a) Outline the properties of Spearman's rank correlation coefficient. A random sample of 5 college students is selected and their grades in mathematics and statistics are found to be calculate Spearman's rank correlation coefficient.

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

[BL: Apply|CO: 5|Marks:6M]

(b) Explain the properties of Spearman's rank correlation coefficient. Calculate the Karl Pearson's coefficient of correlation from the following data. [BL: Apply|CO: 5|Marks:6M]

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) Interpret the properties of regression coefficients. [BL: Apply|CO: 5|Marks:6M]

(b) Construct the regression equation of Y on X from the data given below, taking deviations from actual means of X and Y.

Price (Rs.)	10	12	13	12	16	15
Amount Demanded	40	38	43	45	37	43

Estimate the likely demand when the price is Rs. 20. [BL: Apply|CO: 5|Marks:6M]

MODULE-V

7. (a) If 48 out of 400 persons in rural area possessed 'cell' phones while 120 out of 500 in urban area. Can it be accepted that the proportion of 'cell' phones in the rural area and Urban area is same or not. Use 5% of level of significance. [BL: Apply|CO: 6|Marks:6M]

(b) It is claimed that a random sample of 49 tires has a mean life of 15200 kms this sample was taken from population whose mean is 15150 kms and S.D is 1200 km test 0.05 level of significance.

[BL: Apply|CO: 6|Marks:6M]

8. (a) A sample of 26 bulbs gives a mean life of 990 hours with S.D of 20hrs. The manufacturer claims that the mean life of bulbs 1000 hrs. Examine whether the sample is up to the standard or not? [BL: Apply|CO: 6|Marks:6M]

(b) The following is the distribution of the number of trucks arriving at a company ware house for every two hours.

Time intervals	0	2	4	6
Frequency of no of trucks	52	130	45	3

Fit Poisson distribution as well as binomial distribution to the above table and Test for the assessment of goodness of fit of both distributions at 0.05 level. Also conclude which distribution frequencies are nearer to the original data. [BL: Apply|CO: 6|Marks:6M]

****END OF EXAMINATION****

16. COURSE OBJECTIVES:

The students will try to learn:

I	The theory of probability, conditional probability, Bayes theorem and their applications.
II	The theory of random variables, basic random variate distributions and their applications.
III	The role of Binomial, Poisson and Normal distributions in solving the real-life problems.
IV	The methods and techniques for quantifying the degree of closeness among two or more variables by using coefficient of correlation and the concept of linear regression analysis.
V	The Estimation theory and hypothesis testing in statistics play a vital role in the assessment of the quality of the materials, products and ensuring the standards of the engineering process.

17. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Explain** the axioms of the probability, conditional probability and by using these concepts, establish the elementary theorems on probability. Explain the role of Bayes theorem in solving the typical uncertain problems in probability.	Understand
CO 2	**Explain** the role of random variables and types of random variables, expected values of the discrete and continuous random variables under randomized probabilistic conditions.	Understand
CO 3	**Interpret** the parameters of random variate Probability distributions such as Binomial, Poisson and Normal distribution by using their probability functions, expectation and variance.	Understand
CO 4	**Apply** the Normal distribution for the problems defined under continuous random variables to find probabilities	Apply
CO 5	**Apply** Bivariate Regression as well as Correlation Analysis for statistical forecasting.	Apply
CO 6	**Identify** the role of statistical hypotheses, types of errors, confidence intervals, the tests of hypotheses for large samples in making decisions over statistical claims in hypothesis testing	Apply

QUESTION PAPER 1: MAPPING OF SEMESTER END EXAMINATION QUESTIONS TO COURSE OUTCOMES

Q.No		**All Questions carry equal marks**	**Taxonomy**	**CO's**	**PO's**

1	a	A committee consists of 9 students 2 of which are from 1st year, 3 from second year and 4 from third year. Three students are to be removed at random. What is the chance that (i) The three students belong to different classes. (ii) Two belong to the same class and third to the different class. (iii) The three belong to the same class	Apply	CO 1	PO 1,4
	b	Three boxes contains: 3 red, 4 white and 1 blue; 1 red, 2 white and 3 blue balls; 4 red, 3 white, and 2 blue balls. One box is chosen at random and a ball is withdrawn it happens to be red. What is the probability that it come from box two.	Apply	CO 1	PO 1,4
2	a	Outline the concept of random variables. Let X denotes the minimum of the two numbers that appear when a pair of fair dice is thrown once. calculate the (i) Expectation (ii) Variance.	Understand	CO 2	PO 1,4
	b	The function $f(x) = Ax^2$, in 0< x<1 is valid probability density function then Calculate the value of A.	Apply	CO 2	PO 1,4
3	a	Out of 20 tape recorders 5 are defective. Find the standard deviation of defective in the sample of 10 randomly chosen tape recorders. Find (i) P(X=0) (ii) P(X=1) (iii) P(X=2) (iv) P (1<X<4).	Apply	CO 3	PO 1,2
	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.	Apply	CO 3	PO 1,2
4	a	Derive the median of the Normal distribution and Explain the properties of normal distribution.	Understand	CO 4	PO 1,2
	b	If 7% of the students scored marks less than 35 and 11% of the students scored above 63 marks calculate the mean and variance assuming normality.	Apply	CO 4	PO 1,2

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<td>Apply</td>
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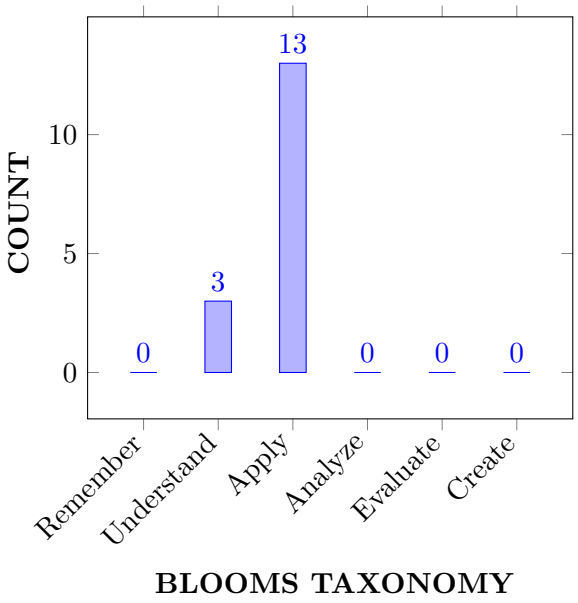
KNOWLEDGE COMPETENCY LEVELS OF MODEL QUESTION PAPER



Signature of Course Coordinator **HOD**