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Name of the Examination: CAT 1 (Winter Sem. 2023-24)

Corse Code: MAT1011 **Course Title:** Applied Statistics

Set number: 03 **Date of exam:** 07/02/2024 (AN)(CJ)

Duration: 90 minutes **Total marks:** 50

Instruction:

1. All questions are compulsory.
2. Assume data whenever necessary.
3. Any assumptions made should be clearly stated.

Q (1) The following data represents the survey regarding the heights of 120 buildings near the peripheral area of Vijayawada airport:

Height (in cm)	0-10	10-20	20-30	30-40	40-50	50-60
No. of buildings	14	17	22	26	28	18

Verify that the relation, $Mode = 3\,Median - 2\,Mean$ is valid for the above grouped data.

10 Marks

Q (2) In a certain assembly plant, three machines, A1, A2 and A3, made 30%, 45% and 25%, respectively, of the products. It is known from past experience that 2%, 3% and 2% of the products made by each machine, respectively, are defective. Now, suppose that a finished product is randomly selected. Using Bayes' theorem, find the probability, if it is defective product of machines A2?

10 Marks

Q (3) A study of 100 engineering companies gives the following information

Profit (Rs in crore)	0-10	10-20	20-30	30-40	40-50	50-60
Number of companies	8	12	20	30	20	10

Calculate the standard deviation of the profit earned.

10 Marks

Q (4) Suppose that in a company of 500 employees, it is found that 210 smoke, 258 drink alcoholic beverages, 216 eat between meals, 122 smoke and drink alcoholic beverages, 83 eat between meals and drink alcoholic beverages, 97 smoke and eat between meals, and 52 engage in all three of these bad health practices. If an employee of this company is selected at random, find the probability that the student

(a) Smokes but does not drink alcoholic beverages;

(b) Eats between meals and drinks alcoholic beverages but does not smoke;

10 Marks

Q (5) An NRI decided to put his land properties out on auction and estimated a reasonable bid amount at the auction. The person has determined that the density function of winning (low) bid is,

$$f(x) = \begin{cases} \frac{5}{8}, & \frac{2}{5} \leq x \leq 2 \\ 0, & elsewhere \end{cases}$$

(a) Find the cumulative distribution function $F(x)$.

(b) Use $F(x)$ to determine the probability that the winning bid is less than the person's preliminary estimation 4.

10 Marks

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1,3			10
Q2	1	1	1,3			10
Q3	1	1	1,3			10
Q4	1	1	1,2			10
Q5	2	2	1,3			10

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QUESTION PAPER

Name of the Examination: WIN 2023-24 Semester – CAT 1

Course Code: MAT1011 **Course Title: Applied Statistics**

Set number: 07 **Date of Exam:** 07/02/2024 (AN)(C2)

Duration: 90 Min. **Total Marks: 50**

Instructions:

1. Assume data wherever necessary.
2. Any assumptions made should be clearly stated.

Q1. Calculate the median and mode for the following distribution of marks obtained by 49 students.

Class (Marks group)	Frequency (Number of students)	Class (Marks group)	Frequency (Number of students)
5 – 10	5	25 - 30	5
10 – 15	6	30 – 35	4
15 – 20	15	35 – 40	2
20 – 25	10	40 – 45	2

(10M)

Q2. Goals scored by two teams in a football session were as follows:

No. of Goals Scored in a Football Match	No. of Football Matches Played	
	Team 'A'	Team 'B'
0	15	20
1	10	10
2	07	05
3	05	04
4	03	02
5	02	01
Total	42	42

Calculate coefficient of variation and state that which is more consistent. **(10M)**

Q3. A bag contains 30 balls numbered from 1 to 30. One ball is drawn at random. Find the probability that the number of the ball drawn will be a multiple of (a) 5 or 7, and (b) 3 or 7. **(10M)**

Q4. A company has two plants to manufacture scooters. Plant 1 manufactures 70% of the scooters and Plant 2 manufactures 30% of the scooters. At Plant 1, 80% of scooters are rated standard quality and at Plant 2, 90% of scooters are rated standard quality. A scooter is picked up at random and is found to be of standard quality. What is the chance that it has come from Plant 1, or Plant 2. **(10M)**

Q5. A function is defined as follows:

$$f(x) = \begin{cases} 0, & x < 2 \\ \frac{1}{18}(2x+3), & 2 \le x \le 4 \\ 0, & x > 4 \end{cases}$$

Show that it is a density function. Find the probability that a random variate having this density will fall in the interval $2 \le x \le 3$? **(10M)**

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			10
Q2	1	1	1			10
Q3	1	1	1			10
Q4	1	1	1			10
Q5	2	3	1, 3			10

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QUESTION PAPER

Name of the Examination: Winter 2023-24 Semester – CAT-1

Course Code: MAT 1011 **Course Title: Applied Statistics**

Set number: 08 **Date of Exam:** 05/02/2024 (AN) (A2)

Duration: 90 min **Total Marks: 50**

Instructions:

Any assumptions made should be clearly stated.

Q1.

A laptop computer maker uses battery packs of two brands, A and B. While both brands have the same average battery life between charges (LBC), the computer maker seems to receive more complaints about shorter LBC than expected for battery packs of brand A. The computer maker suspects that this could be caused by higher variances in LBC for brand A. To check that, ten new battery packs from each brand are selected, installed on the same models of laptops, and the laptops are allowed to run until the battery packs are completely discharged. The following are the observed LBCs in hours:

Brand A	3.2	3.7	3.1	3.3	2.5	2.2	3.2	3.1	3.2	4.3
Brand B	3.4	3.6	3.0	3.2	3.2	3.2	3.0	3.1	3.2	3.2

Find the Arithmetic means and Variances of A and B respectively. Find the coefficient of variations and compare the battery life of both companies.

(10M)

Q2.

The duration of time (minutes) for PCB printing for a machine is a random event, with probability density function

$$f(x) = \begin{cases} A\, e^{-\frac{x}{5}} & , \ for\ x \geq 0 \\ 0 , & otherwise. \end{cases}$$

(i) Find the value of A such that $f(x)$ be a probability density function.

(ii) What is the probability that the time that the machine will take to print a board is more than 10 minutes?

((5+5)=10M)

Q3.

In a factory that manufactures bearings, machines A, B and C manufacture 30%, 50% and 20% of the bearings respectively. Of their output, 3%, 4% and 1% respectively are defective. A bearing is drawn at random from the product and is found to be defective. Find the probability that this is not manufactured by machine B.

(10M)

Q4.

The median of the distribution given below is14.4. Find the values of x and y, if the total frequency is 20 and also find the mean and mode.

Class interval	$0-6$	$6-12$	$12-18$	$18-24$	$24-30$
Frequency	4	x	5	y	1

(10M)

Q5.

The class has a question bank consisting of 300 easy True/False questions, 200 difficult True/False questions, 500 easy multiple choice questions and 400 difficult multiple choice questions. If a question is selected at random from the question bank, what is the probability that it will be an easy question given that it is a multiple-choice question?

(10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			10
Q2	2	2	3			10
Q3	1	1	1			10
Q4	1	1	1			10
Q5	1	1	1			10