



Name of the Examination: WINTER 2023-24-CAT-1

Course Code: MAT 1011

Set Number: O\

Duration: 90 minutes

Course Title: Applied Statistics

Date of Examination: 06/02/2024 (Fr) (B)

Total Marks: 50

1. The age distribution of 400 persons in a colony having median age 32 is given below

Age(In years)	20 – 25	25 – 30	30 – 35	40 – 45	45 – 50	50 – 60
Number of Students	110	a	b	75	55	30

(a) Find the value of a and b .

(b) Find the *mean* and *mode* of the above distribution.

15 M

2. Two plants C and D of a factory show the following results about the number of workers and the wages paid to them.?

No. of workers	500	6000
Average monthly wages(\$)	2500	2500
Standard deviation	9	10

Using coefficient of variation formulas, find in which plant, C or D , is there greater variability in individual wages.

5M

3. We roll a fair die twice and obtain two numbers X_1 = result of the first roll and X_2 = result of the second roll. We know that $X_1 + X_2 = 6$, what is the probability that $X_1 = 3$ or $X_2 = 3$? 10M

4. A total of 48 percent of the women and 37 percent of the men that took a certain “quit smoking” class remained nonsmokers for at least one year after completing the class. These people then attended a success party at the end of a year. If 62 percent of the original class was male, what percentage of those attending the party were women?

10M

5. The resistance X of an electrical component has a probability density function

$$f(x) = \begin{cases} \frac{x}{3} & 0 \leq x \leq 2 \\ 0 & \text{otherwise.} \end{cases}$$

(a) Calculate the cumulative distribution function.

(b) What is the probability that the electrical component has a resistance between 1 and 1.5?

10M



QUESTION PAPER

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

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 04

Date of Exam: 06/02/2024 (AN)

Duration:

Total Marks: 50

(B2)

Instructions:

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

Q1. Find the arithmetic mean and median weight of 40 male college students at state university by using the following frequency distribution. **(10M)**

Weight (in lb)	118-126	127-135	136-144	145-153	154-162	163-171
frequency	3	5	9	12	5	4

Q2. (a) Find the standard deviation of the following numbers gives the number of weeks needed to find a job for 25 older workers that lost their jobs as a result of corporation downsizing.

13, 3, 17, 7, 22, 22, 26, 17, 13, 14, 16 **(5+5M)**

(b) A survey of 25 faculty members is taken in a college to study their vocational mobility. They were asked the question "In addition to your present position, at how many educational Institutes have served on the faculty?" Compute the mode of the following frequency distribution of their responses.

x	0	1	2	3
f	8	11	5	1

Q3. A number is chosen from the first 100 natural numbers. Find the probability that it is a number 4 or 6. **(10M)**

Q4. Three persons A, B and C have applied for a job in a private company. The chance of their selections is in the ratio 1:2:4. The probabilities that A, B and C can introduce changes to improve the profits of the company are 0.8, 0.5 and 0.3 respectively. If the change does not take place, find the probability that it is due to the appointment of C. **(10M)**

Q5. The length of time, in minutes, that a customer queues in Post office is a random variable T, with probability density function

$$f(t) = \begin{cases} c(81 - t^2), & 0 \leq t \leq 9 \\ 0, & \text{elsewhere} \end{cases}$$

(a) What is the value of c.

(b) Find the probability that a customer will queue longer than three minutes. **(5+5 M)**



QUESTION PAPER

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

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 05

Date of Exam: 05/02/2024 (FRI) (A)

Duration: 90 min

Total Marks: 50

Instructions:

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

Q1. If the mean of the given frequency distribution is 35, then find the missing frequency k . Also, calculate the median and mode of the distribution.

Class	10-20	20-30	30-40	40-50	50-60
Frequency	2	4	7	k	1

(10M)

Q2. In a class of 200 students, the mean and standard deviation of the marks obtained in FAT exam of Discrete Mathematics were found to be 40 and 15, respectively. Later on it was discovered that the marks 43 and 35 were misread as 34 and 53, respectively. Find the corrected mean and standard deviation corresponding to the corrected marks and using them also find the corrected coefficient of variation.

(10M)

Q3. For married couples living in a certain city, the probability that the husband will vote on a bond referendum is 0.21, the probability that the wife will vote on the referendum is 0.28, and the probability that both the husband and the wife will vote is 0.15. What is the probability that
(a) at least one member of a married couple will vote?
(b) a husband will vote, given that his wife will not vote?

(10M)

Q4. Factory A produces 1000 toys of which 20 are defective, factory B produces 4000 toys of which 40 are defective and factory C produces 5000 toys of which 50 are defective. All these toys from the three factories are put together in a stockpile. One of the toys is chosen from the stockpile and is found to be defective. What is the probability that it is from
(a) factory A (b) factory B.

(10M)

Q5. The amount of time (in hours) that a semi-conductor device works before breaking down is a continuous random variable having probability density function defined by:

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

- (a) Find the value of λ .
- (b) Find the probability that the device will work between 50 and 150 hours before breaking down.

(10M)



Question Paper

Name of the Examination: CAT

School	School of Advanced Sciences		
Course Code	MAT1011	Course Title	Applied Statistics
Semester	FAST TRACK FALL (2022-23) -AMR	Date of exam	02-08-2022 (Tuesday)
Slot	AP2022231000124 (E/TE)		
Duration	90 min	Total Marks	50

Instructions: -

- 1) The question paper contains five questions.
- 2) All questions are compulsory.
- 3) The number of marks carried by a question/part is indicated against it.
- 4) Use appropriate statistical table, if required.

Q.1:

i) Two balls are drawn in succession without replacement from an urn containing 4 red balls and 3 black balls. The possible outcomes and the values of y of the random variable Y , where Y is the number of red balls.

ii) A certain type of storage battery lasts, on average 3.0 years with a standard deviation of 0.5 year. Assuming that battery life is normally distributed, find the probability that a given battery will last less than 2.3 years. {given: $P(z < -1.4) = 0.0808$ }

[3+7 M]

Q.2: For the following probability distribution, find $E\{g(x)\}$, where $g(X) = 2X - 1$.

x	4	5	6	7	8	9
$P(X=x)$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{6}$

[10 M]



Name of the Examination: CAT (FALL 2022-23)

Course Code: MAT1011

Course Title: Applied Statistics

Slot:D2+TD2

Date of Exam: 03-11-2022

Duration: 90 min

Total marks: 50

1. The following data relates to the daily income of families in an urban area. Find the Mean, Median and Mode

Income	0-100	100-200	200-300	300-400	400-500	500-600
No.of persons	5	8	11	15	10	5

2. Given three identical boxes I, II and III each containing two coins. In box I, both coins are gold coin, in box II, both are silver coins and in the box III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, using Bayes rule find the probability that the other coin in the box is also of gold.
3. A traffic engineer is interested in the number of vehicles reaching a particular crossroads during periods of relatively low traffic flow. The engineer finds that the number of vehicles X reaching the crossroads per minute is governed by the probability distribution. Calculate the mean and variance of the random variable X .

X	0	1	2	3	4
P(X=x)	0.37	0.39	0.19	0.04	0.01

4. A worn, poorly set-up machine is observed to produce components whose length X follows a normal distribution with mean 20 cm and variance 2.56 cm. Calculate (a) the probability that a component is at least 24 cm long, (b) the probability that the length of a component lies between 19 and 21 cm.
5. A warehouse manager of a company dealing in large quantities of steel cable needs to be able to estimate how much cable is left on his partially used drums. A random sample of eight partially used drums is taken and each drum is weighed and the corresponding length of cable measured. The results are given in the table below. Find the correlation coefficient and regression line and use it to predict the lengths of cable left on drum whose weight is 35kg.

Weight of Drum and cable	30	40	40	50	50	50	60	70
Measured length of cable	70	90	100	120	130	150	160	190

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			10
Q2	2	2	1,3			10
Q3	3	3	1,2			5
Q4	3	3	1,2			10
Q5	4	4	3			15

QUESTION PAPER

Name of the Examination: CAT (FALL 2022-2023)

Course Code: MAT 1011

Course Title: Applied Statistics

Slot: G2+TG2 (AP2022232001035)

Date of Exam: 07-11-2022

Duration: 90 min

Total Marks: 50

Q1. In a class, the number students secured the marks in a mid-examination. Obtain Median and Mode to the following data. **(10M)**

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	120	145	250	200	185

Q2. The chances of X, Y, Z becoming managers of certain company are 4:2:3. The probabilities that bonus scheme will be introduced, if X, Y, Z become managers are 30%, 50% and 80% respectively. If the scheme is introduced. What is the probability that X is appointed as the manager. **(10M)**

Q3. Find expected value and variance of the number on a dice thrown. **(5M)**

Q4. A city installs 2000 electric lamps for street lighting. These lamps have a mean burning life of 1000 hours with standard deviation of 200 hours.

- (i) What is the probability that a lamp will fail in the first 700 burning hours?
- (ii) What is the probability that a lamp will fail between 900 & 1300 burning hours? **(10M)**

Q5. The following table gives age of cars of certain make and annual maintenance cost. Obtain Correlation coefficient and regression lines for costs related to age of cars. Also estimate the maintenance cost for the age of car is 15. **(15M)**

Age of Cars (in years)	2	4	6	8	10
Maintenance Cost (\$ '00)	10	20	25	30	40

QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Course Code: MAT1011

Course Title: Applied Statistics

Slot: TD1 Class id: AP2021225000086

Date of Exam: 21.04.2022

Duration: 90 min

Total Marks: 50

Instructions:

1. Answer all the questions
- Q1.** The time taken to assemble a car in a certain plant is a random variable having a normal distribution of 20 hours and a standard deviation of 2 hours. What is the probability that a car can be assembled at this plant in a period
- a) less than 19.5 hours?
 - b) between 20 and 22 hours? (12M)
- Q2.** The following data were collected to determine the relationship between the pressure and the corresponding scale reading for the purpose of calibration.
- | Pressure | 10 | 10 | 10 | 10 | 10 | 50 | 50 | 50 | 50 | 50 |
|---------------|----|----|----|----|----|----|----|----|----|----|
| Scale Reading | 13 | 18 | 16 | 15 | 20 | 86 | 90 | 88 | 88 | 92 |
- (a) Find the equation of the regression line.
(b) Estimate the pressure using a scale reading of 54. (12M)
- Q3.** Suppose you start up a company that has developed a drug that is supposed to increase IQ. You know that the standard deviation of IQ in the general population is 15. You test your drug on 36 patients and obtain a mean IQ of 97.65. Using an alpha value of 0.05, is this IQ significantly different than the population mean of 100? (13M)
- Q4.** A company wanted to compare the performance of its call centre employees in two different centres located in two different parts of the country – Hyderabad, and Bengaluru, in terms of the number of tickets

resolved in a day (hypothetically speaking). The company randomly selected 30 employees from the call centre in Hyderabad and 30 employees from the call centre in Bengaluru. The following data was collected:

Hyderabad: $\bar{x}_1 = 750$, $\sigma_1 = 20$

Bengaluru: $\bar{x}_2 = 780$, $\sigma_2 = 25$

The company wants to determine if the performance of the employees in Hyderabad is different from the performance of the employees in the Bengaluru centre. To do this, we will use a two-sample z-test for means.

(13M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1,3	1	1	12
Q2	2	2	1,3	2	1	12
Q3	3	3	1,2	2	1	13
Q4	3	3	1,2	2	1	13



Name of the Examination: CAT2

School	School of Advanced Sciences		
Course Code	MAT1011	Course Title	Applied Statistics
Semester	WIN 2021-2022	Date of exam	25-04-2022
Slot	TG2 (class id- AP2021225000088)	Faculty Name & ID	Dr. Kiran Kumar Patra, Emp id-70146
Duration	90 min	Total Marks	50

Instructions

1. All questions are compulsory
2. The question paper contains four questions.
3. The number of marks has been indicated near each question.
4. Upload clear images of the written answers.

Q1.

The heights of adult females are normally distributed with mean 160cm and standard deviation 8cm. Find the probability that a randomly selected adult female has a height greater than 170cm. Find the probability that a randomly selected female has height between 160cm and 180cm.

[11M]

Q2.

Find the regression line of y (expansion of gelatine in percentage) on x (humidity of air in percentage) using $(x, y) = (30, 3.1), (30, 3.2), (60, 6.3), (60, 6.5), (90, 10.0)$. Predict the expansion of gelatine when the humidity of air is 40%.

[13M]

Q3.

The speed of a particle is claimed to be different from 0.340cm/s. We will test on the basis of 35 samples at the 0.05 level of significance.

As per the information collected from similar analysis we can expect that the mean is 0.343cm/s and the standard deviation of such determinations is 0.010cm/s. Perform a hypothesis test using critical value approach to verify claim and also use the p-value method to support your conclusion.

[13M]

Q4.

Engineers at a large automobile manufacturing company are trying to decide whether to purchase brand A or brand B tires for the company's new models. To help them arrive at a decision, an experiment is conducted using 50 sample size of brand A and 55 sample size of brand B. The tires are run until they wear out. The mean and standard deviations are as follows:

Brand A: $\bar{x}_1 = 37,900 \text{ km}$, $\sigma_1 = 5,100 \text{ km}$

Brand B: $\bar{x}_2 = 39,800 \text{ km}$, $\sigma_2 = 5,900 \text{ km}$

Test the hypothesis using 0.05 level of significance that the average wear of brand B tires is larger than brand B tires. Assume the populations to be approximately normally distributed with equal variances. Use both critical value method and p-value approach.

[13M]

***** End of Question Paper*****

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	CO1	PO1			11
Q2	2	CO2	PO1, PO3			13
Q3	3	CO3	PO1, PO2			13
Q4	3	CO3	PO1, PO2			13



QUESTION PAPER

Name of the Examination: CAT (LONG SUMMER 2021-2022)

Course Code: MAT1011

Course Title: Applied Statistics

Slot: B+TB+TBB

Date of Exam: 02-07-2022 (Saturday)

Duration: 90 min

Total Marks: 50

Instructions

- 1. The question paper contains five questions**
- 2. Answer all questions**
- 3. The marks allotted for each question are shown along**

Q1. The coefficient of correlation between two variables X and Y is 0.4 and their covariance is 10. If variance of X series is 9, find variance of Y. [5]

Q2. The average number of monthly breakdowns of a machine is equal to 1.8. Find the probability that this machine will work (a) without a breakdown, (b) with at least one breakdown, and (c) with only one breakdown for a month. [10]

Q3. A box contains 12 items of which 3 are defective. A sample of 3 items are selected at random from this box. A sample of 3 items are selected at random from this box. What is the expectation of the number of defective items? [10]

Q4. The lifetime of certain kinds of viruses have mean of 300 hours and standard deviation of 25 hours. [10]

- a) Find the probability that any one of these viruses will have a lifetime of more than 350 hours.
- b) What percentage will have lifetimes of 300 hours or less?
- c) What percentage will have lifetimes from 220 to 260 hours?

Q5. The following table gives indices of industrial production and number of registered unemployed people (in lakh). Calculate the value of the correlation coefficient and interpret its value. [15]

Year: 1991 1992 1993 1994 1995 1996 1997 1998

Index of Production: 100 102 104 107 105 112 103 99

Number Unemployed: 15 12 13 11 12 12 19 26

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	2	CO5	PO1, PO2			5
Q2	1	CO1	PO1,			10
Q3	1	CO1	PO1			10
Q4	1	CO1,CO2	PO1, PO3			10
Q5	2	CO5	PO1, PO2			15



Name of the Examination: CAT

School	School of Advanced Sciences		
Course Code	MAT 1011	Course Title	Applied Statistics
Semester	Fall 2022-23	Date of exam	04-11-2022
Slot	E1+TE1 AP2022232000303	Faculty Name & ID	Dr. Sukanta Nayak, 70305
Duration	90 min.	Total Marks	50

Answer the following questions

Q1. Calculate the mean, median, and mode (by combined formula) from the following data.

Class groups	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequencies	5	9	13	21	20	15	8	3

[10 Marks]

Q2. A person has undertaken a construction job. The probabilities are 0.65 that there will be strike, 0.80 that the construction job will be completed on time if there is no strike, and 0.32 that the construction job will be completed on time if there is a strike. Using Baye's theorem, determine the probability that the construction job will be completed on time.

[10 Marks]

Q3. Suppose X be a discrete random variable with the following Probability Mass Function (PMF).

$$P_X(x) = \begin{cases} 0.1 & \text{for } x = 0.2 \\ 0.2 & \text{for } x = 0.3 \\ 0.2 & \text{for } x = 0.4 \\ 0.3 & \text{for } x = 0.8 \\ 0.2 & \text{for } x = 1 \\ 0 & \text{otherwise} \end{cases}$$

- (i) Find R_X , the range of random variable X .
- (ii) Find $P(X \leq 0.5)$.

[05 Marks]

Q4. The salaries of MIT professors are approximately normally distributed. Suppose you know that 33 percent of professors earn less than \$80,000. Also, 33 percent earn more than \$120,000.

- (i) What is the probability that a MIT professor makes more than \$100,000?

(ii) What is the probability that a MIT professor makes between \$70,000 and \$80,000?

[10 Marks]

Q5. Obtain the correlation coefficient of the give sets of data. Then for the same find the line of regression of Y (response an experiment) on X (observation of an experiment) and predict the value of Y when X is 55.

X	40	50	38	60	65	50	35
Y	38	60	55	70	60	48	30

[15 Marks]

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			10
Q2	2	2	1, 3			10
Q3	3	3	1, 2			5
Q4	3	3	1, 2			10
Q5	4	4	1, 2			15



Name of the Examination: CAT

School	School of Advanced Sciences		
Course Code	MAT 1011	Course Title	Applied Statistics
Semester	Fall 2022-23	Date of exam	07-11-2022
Slot	G1+TG1 AP2022232001034	Faculty Name & ID	Dr. Sukanta Nayak, 70305
Duration	90 min.	Total Marks	50

Answer the following questions

Q1. From the following data, compute the mean marks of all the students of 50 schools in a city.

Marks obtained	Number of schools	Average number of students in a school
More than 35	7	200
30-35	10	250
25-30	15	300
20-25	9	200
15-20	5	150
Less than 15	4	100

[10 Marks]

Q2. Bag I contain 3 red and 4 black balls while another Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Using Baye's theorem, find the probability that it was drawn from Bag II.

[10 Marks]

Q3. John rolled two dice and observed two number X and Y on two dices respectively.

- (i) Find the ranges R_X and R_Y of the random variables X and Y .
- (ii) Find the probability mass functions of X and Y .
- (iii) Find the probability $P(X = 2, Y = 6)$.

[5 Marks]

Q4. Let X be a random variable distributed normally with mean value 2 and standard deviation is 4. Then for a random variable $Y = 3 - 2X$, find the following probabilities.

- (i) Find $P(X > 1)$.
- (ii) Find $P(-2 < Y < 1)$.
- (iii) Find $P(X > 2|Y < 1)$.

[10 Marks]

Q5. The percentages of a class of 9 students on a midterm examination (X) and on the final examination (Y) are as follows.

X	77	50	71	72	81	94	96	99	67
Y	82	66	78	34	47	85	99	99	68

- (i) Find the correlation coefficient between X and Y .
- (ii) Estimate the linear regression line.
- (iii) Estimate the final examination percentage of a student who received a percentage of 86 on the midterm examination.

[15 Marks]

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			10
Q2	2	2	1, 3			10
Q3	3	3	1, 2			5
Q4	3	3	1, 2			10
Q5	4	4	1, 2			15



QUESTION PAPER

Name of the Examination: CAT – 2 (Winter 2021-2022)

Course Code: MAT1011

Course Title: Applied Statistics

Slot: F1 (AP202122500090)

Date of Exam: 23-04-2022

Duration: 90 min

Total Marks: 50

Instructions:

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

Q1. The time needed to complete a final examination in a particular college course is normally distributed with a mean of 80 minutes and a standard deviation of 10 minutes.

- (a) What is the probability of completing the exam in one hour or less?
- (b) What is the probability that a student will complete the exam in more than 60 minutes but less than 75 minutes?
- (c) Assume that the class has 60 students, and that the examination period is 90 minutes in length. How many students do you expect will be unable to complete the exam in the allotted time?

(12M)

Q2. A sales manager collected the following data on annual sales for new customer accounts and the number of years of experience for a sample of 8 salespersons.

Sales person	1	2	3	4	5	6	7	8
Years of experience	1	3	4	4	6	8	10	10
Annual sales (\$1000's)	80	97	92	102	103	111	119	123

- (a) Develop an estimated regression equation that can be used to predict annual sales given the years of experience.
- (b) Provide an interpretation for the slope of the estimated regression equation
- (c) Predict annual sales for a salesperson with 9 years of experience.

(14M)

Q3. A sales manager collected the following data on annual sales for new customer accounts and the number of years of experience for a sample of 8 salespersons.

Sales person	1	2	3	4	5	6	7	8
Years of experience	1	3	4	4	6	8	10	10
Annual sales (\$1000's)	80	97	92	102	103	111	119	123

- (a) Develop an estimated regression equation that can be used to predict annual sales given the years of experience.
- (b) Provide an interpretation for the slope of the estimated regression equation
- (c) Predict annual sales for a salesperson with 9 years of experience.

(12M)

Q4. The following table shows how many weeks a sample of 6 persons have worked at an automobile inspection station and the number of cars each one inspected between noon and 2 P.M. on a given day.

Number of weeks employed	2	7	9	1	5	12
Number of cars inspected	13	21	23	14	15	21

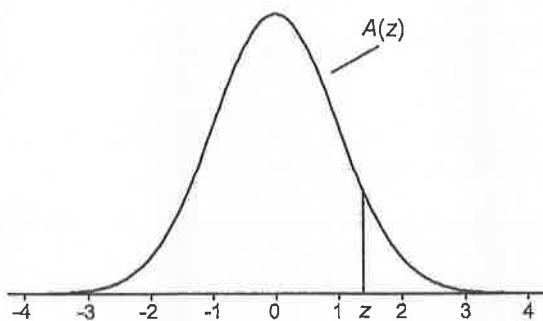
Obtain the correlation coefficient between Number of weeks employed and Number of cars inspected.

(12M)

QP MAPPING

Q. NO.	MODULE NUMBER	CO MAPPED	PO MAPPED	PEO MAPPED	PSO MAPPED	MARKS
Q1	1	CO1	PO1			12
Q2	2	CO1	PO1			14
Q3	2	CO2	PO1, PO3			12
Q4	3	CO2, CO3	PO1, PO3			12

TABLE A.1
Cumulative Standardized Normal Distribution



$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							



WINTER 2021-22

Name of the Examination: FAT

School	School of Advanced Sciences		
Course Code	MAT1011	Course Title	Applied Statistics
Semester	Winter 2021-22	Date of exam	26-05-2022
Slot	TD1	Faculty Name & ID	
Duration	120mts	Total Marks	60

ANSWER ALL QUESTIONS

Q1. A book containing 150 pages has 100 misprints. Find the probability that a particular page contains (a) no misprints, (b) 5 misprints, (c) at least 2 misprints, (d) more than 1 misprint.

Q2. Two operators are checking the same dimension on the same sample of 10 parts. Below are the results. Is there a significant operator measurement error? Test at the 5% significance level.

Serial Number	Operator 1	Operator 2
1	63	65
2	56	57
3	62	60
4	59	58
5	62	59
6	50	57
7	63	63

Q3. In a study conducted at Virginia Tech., the plasma ascorbic acid levels of pregnant women were compared for smokers and Non-smokers. Thirty-two women in the last three months of pregnancy, free of major health disorders, ranging in age from 15 to 32 years, were selected for the study. Prior to the collection of 20ml of blood, the participants were told to avoid breakfast, forgo their vitamin supplements, and avoid foods high ascorbic acid content.

From the blood samples, the following plasma ascorbic acid values were determined, the milligrams in 100milliliters:

Plasma Ascorbic Acid values

Non-smokers	Smokers
0.97	0.48
0.72	0.71
1.00	0.98
0.81	0.68
0.62	1.18
1.32	1.36
1.24	0.78
0.99	1.64

Is there sufficient evidence to conclude that there is a difference between plasma ascorbic acid levels of smokers and non-smokers at 5% level of Significance? Assume that the two sets of the data came from normal populations with unequal variances. Use P-Value.

- Q4. An experiment was conducted to compare alcohol content of soy sauce on two different production lines. Production was monitored 5 times a day. The data are shown here.

Production line 1: 0.48, 0.39, 0.42, 0.52, 0.4

Production line 2: 0.38, 0.37, 0.39, 0.41, 0.38

Assume both the populations are normal. It is suspected that production line 1 is not producing as consistently as production line 2 in terms of alcohol content. Test at 5% level of significance that the hypothesis that $\sigma_1 = \sigma_2$, against alternative hypothesis $\sigma_1 \neq \sigma_2$. Use P-value.

- Q5. Nadir is testing an octahedral die to see if it is biased. The results are given in the table below.

Score	1	2	3	4	5	6	7	8
Frequency	7	10	11	9	12	10	14	7

Test the hypothesis that the die is fair at the 5% level of significance.

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	CO1	PO1, PO3	PEO1,	PSO1	12
Q2	3	CO4	PO1, PO3,PO2	PEO1	PSO1	12
Q3	3	CO6	PO1.PO6	PEO1	PSO1	12
Q4	4	CO5	PO1, PO2	PEO1	PSO1	12
Q5	4	CO5	PO1, PO2	PEO1	PSO1	12



QUESTION PAPER

Name of the Examination: FAT (Winter 2021-2022)

Course Code: MAT1011

Course Title: Applied Statistics

Slot: F1

Date of Exam: 28-05-2022

Duration: 120 min

Total Marks: 60

Instructions: Assume data wherever necessary and any assumptions made should be clearly stated.

Q1. Suppose that during meditation, the reduction of a person's oxygen consumption is a random variable X having the probability density function $f(x) = \begin{cases} \frac{x+2}{18}, & \text{if } -2 < x < 4 \\ 0, & \text{otherwise.} \end{cases}$. Find mean of X and $(X + 2)^2$. (12M)

Q2. Two types of new cars produced in U.S.A. are tested for petrol mileage, one sample is consisting of 42 cars averaged 15 kmpl while the other sample consisting of 80 cars averaged 11.5 kmpl with population variances as $\sigma_1^2 = 2$, $\sigma_2^2 = 1.5$ respectively. Test whether there is any significance difference in the mean petrol consumption of these two types of cars. (use $\alpha = 0.01$) (12M)

Q3. Ten soldiers participated in a shooting competition in the first week. After intensive training they participated in the competition in the second week. Their scores before and after are as follows:

Scores before	67	24	57	55	63	54	56	68	33	43
Scores after	70	38	58	58	56	67	68	75	42	38

Do the data indicate that the soldiers have been benefitted by the training? (12M)

Q4. The following random samples are measurements of the heat-producing capacity of specimens of coal from two mines:

Mine1	8260	8130	8350	8070	8340	-
Mine2	7950	7890	7900	8140	7920	7840

Use the 0.05 level of significance to test whether it is reasonable to assume that the variances of the two populations are equal. (12M)

Q5. The demand for a particular spare part in a factory was found to vary from day-to-day. In a sample study the following information was obtained.

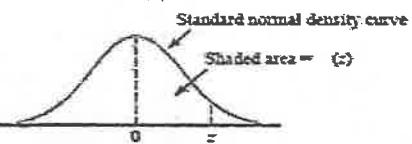
Days	Mon.	Tue.	Wed.	Thurs.	Fri.	Sat.
Number of parts demanded	1124	1125	1110	1120	1126	1115

Use chi square test to test the number of parts demanded does not depend on the day of the week. ($\alpha = 0.05$) (12M)

QP MAPPING

Q. NO.	MODULE NUMBER	CO MAPPED	PO MAPPED	PEO MAPPED	PSO MAPPED	MARK
Q1	1	CO2	PO1			12
Q2	3	CO3	PO1, PO2			12
Q3	4	CO3	PO2, PO3			12
Q4	4	CO3, CO4	PO2, PO3			12
Q5	4	CO3, CO4	PO2, PO3			12

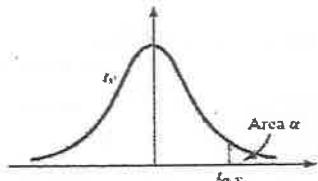
$$(z) = P(Z \leq z)$$



<i>z</i>	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0038
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0189
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0352	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0722	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3482
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

<i>z</i>	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9278	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9933	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Critical Points of the t -Distribution



Degrees of freedom v	α						
	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
1	3.078	6.314	12.706	34.821	63.657	318.31	636.62
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.333	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.371	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.723
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.673
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

$F_{(1-\alpha), v_1}$

v_1	Degrees of freedom for the numerator (v_1)																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	242.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.4
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.46	19.47	19.48	19.49	19.50	19.51
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.64
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.19	4.10	4.05	4.00	3.94	3.87	3.83	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.24
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.94
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.72
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.41
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.83	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.14
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.97
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.93
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.89
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.86
21	4.32	3.47	3.07	2.84	2.65	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.82
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.74
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.72
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.70
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.30	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.68
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.66
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.76	1.70	1.65
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.63
40	4.06	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.52
60	4.00	3.15	2.76	2.53	2.35	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.41
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.29
∞	3.84	3.00	2.66	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.62	1.56	1.50	1.43	1.32	1.22	1.16

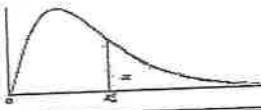


Table A.5 Critical Values of the Chi-Squared Distribution

v	α									
	0.995	0.99	0.98	0.975	0.95	0.90	0.80	0.75	0.70	0.50
1	0.04393	0.03157	0.02628	0.02082	0.00393	0.0158	0.0642	0.102	0.148	0.455
2	0.0100	0.0201	0.0404	0.0506	0.103	0.211	0.446	0.575	0.713	1.356
3	0.0717	0.115	0.185	0.216	0.352	0.584	1.005	1.213	1.424	2.366
4	0.207	0.297	0.429	0.454	0.711	1.064	1.649	1.923	2.195	3.357
5	0.412	0.554	0.752	0.831	1.145	1.610	2.343	2.675	3.000	4.351
6	0.676	0.872	1.134	1.237	1.635	2.204	3.070	3.455	3.528	5.348
7	0.059	1.239	1.564	1.600	2.167	2.833	3.822	4.255	4.671	6.346
8	1.344	1.847	2.032	2.180	2.733	3.490	4.594	5.071	5.527	7.344
9	1.735	2.088	2.532	2.700	3.325	4.168	5.380	5.899	6.303	8.343
10	2.156	2.558	3.059	3.247	3.940	4.865	6.179	6.737	7.267	9.342
11	2.603	3.053	3.609	3.816	4.575	5.578	6.959	7.594	8.148	10.341
12	3.074	3.571	4.178	4.404	5.226	6.304	7.807	8.438	9.034	11.340
13	3.565	4.107	4.765	5.009	5.892	7.041	8.634	9.299	9.926	12.340
14	4.075	4.660	5.368	5.629	6.571	7.790	9.467	10.165	10.821	13.339
15	4.601	5.229	5.985	6.262	7.261	8.547	10.307	11.037	11.721	14.339
16	5.142	5.812	6.614	6.908	7.962	9.312	11.152	11.912	12.624	15.338
17	5.007	6.408	7.255	7.564	8.672	10.085	12.002	12.792	13.531	16.338
18	6.265	7.015	7.906	8.231	9.390	10.863	12.857	13.675	14.440	17.338
19	6.844	7.633	8.567	8.907	10.117	11.651	13.716	14.562	15.352	18.338
20	7.434	8.260	9.237	9.501	10.851	12.443	14.578	15.452	16.266	19.337
21	8.034	8.897	9.915	10.283	11.591	13.240	15.445	16.344	17.182	20.337
22	8.643	9.542	10.600	10.952	12.358	14.041	16.314	17.240	18.101	21.337
23	9.260	10.196	11.293	11.659	13.091	14.848	17.187	18.137	19.021	22.337
24	9.856	10.856	11.992	12.401	13.848	15.659	18.062	19.037	19.943	23.337
25	10.520	11.524	12.607	13.120	14.611	16.473	18.940	19.939	20.867	24.337
26	11.160	12.198	13.409	13.844	15.379	17.292	19.820	20.843	21.792	25.336
27	11.508	12.878	14.125	14.573	16.151	18.114	20.703	21.749	22.718	26.336
28	12.461	13.565	14.847	15.308	16.928	18.939	21.588	22.657	23.647	27.336
29	13.121	14.256	15.574	16.047	17.708	19.768	22.475	23.567	24.577	28.336
30	13.787	14.953	16.306	16.791	18.493	20.599	23.364	24.478	25.505	29.336
40	20.707	22.184	23.838	24.433	26.509	29.051	32.345	33.66	34.872	39.835
50	27.991	29.707	31.664	32.357	34.764	37.689	41.449	42.942	44.313	49.335
60	35.534	37.485	39.609	40.452	43.185	46.459	50.641	52.294	53.809	59.335

Table A.5 (continued) Critical Values of the Chi-Squared Distribution

v	α									
	0.30	0.25	0.20	0.10	0.05	0.025	0.02	0.01	0.005	0.001
1	1.074	1.323	1.642	2.705	3.841	5.024	5.412	6.635	7.879	10.827
2	2.408	2.773	3.219	4.605	5.991	7.378	7.824	9.210	10.597	13.815
3	3.665	4.108	4.642	6.251	7.815	9.348	9.837	11.345	12.838	16.266
4	4.878	5.385	5.959	7.779	9.468	11.143	11.668	13.277	14.860	18.466
5	6.064	6.626	7.259	9.236	11.070	12.832	13.358	15.086	16.750	20.515
6	7.231	7.841	8.558	10.645	12.592	14.449	15.033	16.812	18.548	22.457
7	8.383	9.037	9.803	12.017	14.067	16.013	16.622	18.475	20.278	24.321
8	9.524	10.219	11.030	13.362	15.507	17.535	18.168	20.090	21.955	26.124
9	10.656	11.389	12.242	14.684	16.910	19.023	19.679	21.666	23.589	27.877
10	11.781	12.549	13.442	15.987	18.307	20.483	21.161	23.209	25.188	29.588
11	12.890	13.701	14.631	17.275	19.675	21.920	22.618	24.725	26.757	31.264
12	14.011	14.845	15.812	18.549	21.026	23.337	24.054	26.217	28.300	32.909
13	15.119	15.984	16.985	19.812	22.362	24.736	25.471	27.688	29.819	34.527
14	16.222	17.117	18.151	21.064	23.685	26.119	26.873	29.141	31.319	36.124
15	17.322	18.245	19.311	22.307	24.996	27.458	28.259	30.578	32.891	37.693
16	18.418	19.369	20.465	23.542	26.296	28.845	29.633	32.000	34.267	39.252
17	19.511	20.459	21.615	24.769	27.587	30.191	30.995	33.409	35.718	40.791
18	20.601	21.605	22.760	25.989	28.569	31.526	32.346	34.805	37.156	42.312
19	21.659	22.718	23.900	27.204	30.144	32.852	33.687	36.191	38.582	43.819
20	22.775	23.828	25.038	28.412	31.410	34.170	35.020	37.566	39.997	45.314
21	23.858	24.935	26.171	29.615	32.671	35.479	36.343	38.932	41.401	46.796
22	24.939	26.039	27.301	30.813	33.924	36.781	37.659	40.289	42.796	45.268
23	26.018	27.141	28.429	32.007	35.172	38.076	38.968	41.638	44.181	49.728
24	27.096	28.241	29.553	33.196	36.415	39.364	40.270	42.980	45.558	51.179
25	28.172	29.339	30.675	34.382	37.652	40.646	41.566	44.314	46.928	52.619
26	29.246	30.435	31.795	35.563	38.885	41.923	42.856	45.642	48.290	54.051
27	30.319	31.528	32.912	36.741	40.113	43.195	44.140	46.963	49.645	55.475
28	31.391	32.630	34.027	37.916	41.337	44.461	45.419	48.278	50.994	56.892
29	32.461	33.711	35.139	39.087	42.557	45.722	46.693	49.558	52.335	58.301
30	33.530	34.800	36.250	40.256	43.773	46.979	47.962	50.892	53.672	59.702
40	44.165	45.616	47.269	51.805	55.758	59.342	60.436	63.691	66.766	73.403
50	54.723	56.334	58.164	63.167	67.505	71.420	72.613	76.154	79.490	86.660
60	65.236	66.981	68.972	74.397	79.082	83.298	84.58	88.379	91.952	99.608



VIT-AP University
Andhra Pradesh
Department of Mathematics (SAS)

WIN Semester-2021-22
FAT Examination

Question Paper

Course name: Applied Statistics
Duration: 120 mins
Slot: TG2

Course code: MAT1011
Full Marks : 60 marks
Date: 30-May-2022 (A.N.)

Answer all five Questions
(Use statistical tabular data wherever necessary)

1. Butterfly-style valves used in heating and ventilating industries have a high flow coefficient (in C_v units). Flow coefficient can be modeled by a normal distribution with mean 496 C_v , and standard deviation 25 C_v . Find the probability that a valve will have a flow coefficient of
 - (a) at least 450 C_v
 - (b) between 445.5 and 522 C_v[5+7=12]
2. A group of five candidates shortlisted for super dream offer in VIT-AP university campus drive. Find the probability mass function of the number of boys and girls in the shortlisted group by assuming equal probabilities for boys and girls. Represent the random variable X as the number of boys in the shortlisted group. Find cumulative distribution function, mean and variance of the distribution of the random variable.
[12]
3. The mean Intelligent Quotients (IQ) of a group of 16 students in your class shows 107 with a standard deviation of 10, while the IQs of 14 students from another group in your class show a mean of 112 with a standard deviation of 8. Use test of hypothesis to determine whether there is a significant difference between the mean IQs of two groups at a 0.01 level of significance. Verify your conclusion using the p-value test?
[12]

4. Carbon dioxide (CO) emission of cigarettes from two different brands (brand-A and brand-B) were tested. The variance of 21 observations of brand-A was found to be 16, whereas variance of 9 observations of brand-B was 8 respectively. Test the hypothesis that variance of brand-A is greater than brand-B at a 5% level of significance. [12]
5. Over a long period of time the grades given by a group of faculties from VIT-AP university in Applied Statistics (MAT1011) course have averaged 12% S's, 18% A's, 40% B's, 18% C's and 12% F's. A new faculty gives 22 S's, 34 A's, 66 B's, 16 C's, and 12 F's during FALL and WIN semesters of 2021-22. Using Chi-square (χ^2) hypothesis testing at a 0.05 level of significance, determine whether the new faculty is following the grade pattern set by the others.

[12]

_____ End _____

QP mapping

Question no.	Module no.	CO	PO	PEO	PSO	Marks
Q1	1	CO2	PO1			12
Q2	1	CO2	PO1			12
Q3	3	CO3	PO1, PO2			12
Q4	4	CO3, CO4	PO2, PO3			12
Q5	4	CO3, CO4	PO2, PO3			12



QUESTION PAPER

Name of the Examination: FAT (LONG SUMMER 2021-2022)

Course Code: MAT1011

Course Title: Applied Statistics

Slot: B+TB+TBB

Duration: 120 min

Total Marks: 60

Instructions

1. The question paper contains five questions
2. Answer all questions
3. The marks allotted for each question are shown along

Q1. Fit a Poisson distribution for the following distribution and test the goodness of fit.

X:	0	1	2	3	4	5	Total
f:	142	156	69	27	5	1	400. [10]

Q2. A random sample of boots worn by 36 soldiers in a desert region showed an average life of 1.08 years with a standard deviation of 0.6 years. Under the standard conditions, the boots are known to have an average life of 1.28 years. Is there a reason to assert at 1% level of significance that use in desert causes the mean life of such boots to decrease? What will be your conclusion if the level of significance is 5%. Assume that life of boots is normally distributed. [15]

Q3. In a sample of 8 observations, the sum of the squared deviations of items from the mean was 94.50. In another sample of 10 observations the value was found to be 101.70. Test whether the difference is significant at 5 per cent level of significance? [10]

Q4. Test made on the breaking strength of 10 pieces of a metal gave the following results: 578, 572, 570, 568, 572, 570, 572, 596, and 584 kg. Test if the mean breaking strength of the wire can be assumed as 577 kg. [10]

Q5. The mean weight of 50 male students who showed above average participation in school athletics was 68.2 kgs with a standard deviation of 2.5 kg. While 50 male students who showed no interest in such participation had a mean weight of 67.5 kgs with a standard deviation of 2.8 kgs. Test the hypothesis that male students who participate in school athletics are healthier than other male students. [10]

Q6. Use following data to find out the two lines of regression and compute the Karl Pearson's coefficient of correlation. [5]

$$\Sigma x = 250, \Sigma y = 300, \Sigma xy = 7900, \Sigma x^2 = 6500, \Sigma y^2 = 10000, n = 10$$

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	4	CO3	PO1, PO2			10
Q2	3	CO3, CO6	PO1, PO2, PO 6			15
Q3	4	CO3	PO1, PO2			10
Q4	3	CO3	PO1, PO2			10
Q5	3	CO6	PO1, PO6			10
Q6	2	CO5	PO1, PO2			5



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

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 03

Date of exam: 07/02/2024 (Fr) (C)

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

- Smokes but does not drink alcoholic beverages;
- 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,

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

- (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



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 (AM) (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:

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

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



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

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

- (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 is 14.4. 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



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 2

Date of Exam: 15-02-2023 (PN)

Duration: 90 min

Total Marks: 50 (C1)

Instructions: -

- 1) The question paper contains four questions.
- 2) All questions are compulsory.
- 3) The number of marks carried by a question/part is indicated against it.

Q.1: The frequency distribution of number of grains per earhead on 50 wheat earheads is given below:

Classes	4-10	10-16	16-22	22-28	28-34	34-40	40-46
Frequency	2	4	10	18	8	5	3

Calculate the mean, median and mode value of this distribution.

(15 M)

Q.2: In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B?

(10 M)

Q.3: Two machines are in operation. Machine A produces 60% of the items whereas machine B produces the remaining 40%. Machine A produces 4% defective items whereas machine B produces 5% defective items. An item is chosen at random, find the probability that it is defective.

(10 M)

Q.4: Let X be a random variable with probability density function as

$$f(x) = \begin{cases} \frac{x}{2}, & 0 < x \leq 1 \\ \frac{1}{2}, & 1 < x \leq 2 \\ \frac{3-x}{2}, & 2 < x < 3 \\ 0, & \text{elsewhere} \end{cases}$$

Find the Mathematical Expectation and Variance of the random variable X.

(15 M)



Name of the Examination: WINTER 2022-23-CAT-1

Course Code: MAT 1011

Course Title: Applied Statistics

Set Number: 3

Date of Examination: 14-02-2023 (PN)

Duration: 90 minutes

Total Marks: 50

(B1)

- If the median marks of 60 students from the distribution given below is 28.50.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of Students	5	x	20	15	y	5

(a) Find the value of x and y.

(b) Find the *mean* and *mode* of the above distribution.

7+9=16

- A gene can be either type *X* or type *Y*, and it can be either dominant or recessive. If the gene is type *Y*, then there is a probability of 0.31 that it is dominant. There is also a probability of 0.22 that a gene is type *Y* and it is dominant. What is the probability that a gene is of type *X*? 8

- A company sells four types of wheelchairs, with type *A* being 12% of the sales, type *B* being 34% of the sales, type *C* being 29% of the sales and type *D* being 25% of the sales. In addition, 19% of the type *A* wheelchair sales are motorized, 50% of the type *B* wheelchair sales are motorized, 32% of the type *C* wheelchair sales are motorized, and 76% of the type *D* wheelchair sales are motorized.

(a) If a motorized wheelchair is sold, what is the probability that it is of type *C*?

(b) If a non-motorized wheelchair is sold, what is the probability that it is of type *D*? 6+6=12

- The resistance *X* of an electrical component has a probability density function

$$f(x) = \begin{cases} Ax(130 - x^2) & 10 \leq x \leq 11 \\ 0 & \text{otherwise.} \end{cases}$$

(a) Calculate the value of the constant *A*.

(b) Calculate the cumulative distribution function.

(c) What is the probability that the electrical component has a resistance between 10.25 and 10.50? 4+4+6=14

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
1	1	1	1			16
2	2	2	1, 3			8
3	2	2	1, 3			12
4	3	3	1, 2			14



QUESTION PAPER

Name of the Examination: CAT1 (Winter 2022-2023)

Course Code: MAT1011

Course Title: Applied Statistics

Set 4

Date of Exam: 14-02-2023 (AN)

Duration: 90 min

Total Marks: 50 (B2)

Instructions:

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

1. The given random data set is: 46, 11, 12, 18, 52, 45, 44, 14, 18, 44, 33, 51, 32, 22, 21, 23, 15, 16, 29, 41, 42, 43, 47, 52, 53, 55, 57, 34, 35, 25.

Now solve the following questions: [08M+08M]

- I. Find the Mean, Median, and Mode of the given data set. Also, interpret your observation by comparing the above results.

- II. Transform the given data set into a group data set by considering the first class interval will be (10-20). Then, find the Median for the group data. Compare the median for the discrete data with the group data and suggest which one is more accurate.

2. Two National parties are competing for the PM position in India. The probability that the Congress party and the BJP party will win are 0.7 and 0.3 respectively. Further, if the congress party wins, the probability of introducing a new product is 0.6 and the corresponding probability is 0.4 if BJP wins. Therefore, find the probability that the new product was introduced by BJP if they win the election. [10M]

3. Four cards are drawn from a pack of cards, Find the probability that [10M]

- I. That all are diamonds.
- II. There are two spades and two hearts.

4. A random variable has a density function [14M]

$$f(x) = \begin{cases} 0 & 0 < x \\ x^3 & 0 \leq x < 1 \\ Rx & 1 \leq x < 2 \\ x^2 & 2 \leq x < 3 \\ 0 & 3 \geq x \end{cases}$$

A) Find the Constant R.
B) Find the P(1 < x < 3)
C) Find P(x < 3)
D) Find P(x > 2)



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 6

Date of Exam: 16-02-2023 (FN)

Duration: 90 minutes

Total Marks: 50

(DI)

Instructions:

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

Q1. The weight of the 40 college students at state university are given in the following table:

Weight	118-126	127-135	136-144	145-153	154-162	163-171	172-180
Number of students	3	5	9	12	5	4	2

Compute arithmetic mean, median, mode for the given data. (15M)

Q2. For married couples living in a certain suburb, the probability that the husband will vote on a bond referendum is 0.21, the probability that the wife will vote on the referendum is 0.28, and the probability that both the husband and the wife will vote is 0.15. What is the probability that

(a) at least one member of a married couple will vote?

(b) A wife will vote, given that her husband will vote?

(c) A husband will vote, given that his wife will not vote? (10M)

Q3. A large firm has 85% of its service calls made by a contractor, and 10% of these calls result in customer complaints. The other 15% of the service calls are made by their own employees, and these calls have a 5% complaint rate.

(a) Find the probability of receiving a complaint.

(b) Find the probability that the complaint was from a customer serviced by the contractor. (10M)

Q4. Suppose the measurement error X of a certain physical quantity is decided by the density function

$$f(x) = \begin{cases} k(3 - x^2), & -1 \leq x \leq 1, \\ 0, & \text{elsewhere.} \end{cases}$$

(a) Determine k that renders $f(x)$ a valid density function.

(b) Find the probability that the error in measurement is less than 1/2. (10M)

Q5. Suppose that the number of cars X that pass through a car wash between 4:00 P.M. and 5:00 P.M. on any sunny Friday has the following probability distribution:

X	4	5	6	7	8	9
$P(X = x)$	1/12	1/12	1/4	1/4	1/6	1/6

Let $g(X) = 2X - 1$ represent the number of attendants needed by the manager for a car wash. Find the expected number of attendants required for car wash between this particular time period. (5M)



Name of the Examination: WINTER 2022-2023-CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 7

Date of Exam: 20-02-2023 (AN)

Duration: 90 min

Total marks: 50 (G1)

Instructions:

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

1. A stopwatch was used to find the time that it took a group of students to run 100 m.

Time (seconds)	10-15	15-20	20-25	25-30	30-35
Frequency	5	12	18	13	2

- (a) Estimate the median.
 (b) Estimate the mean.
 (c) Is the median in the modal class?
 (d) Is the median greater or less than the mean? (15 marks)

2. A car repair can be performed either on time or late and either satisfactorily or unsatisfactorily. The probability of a repair being on time and satisfactory is 0.26. The probability of a repair being on time is 0.74. The probability of a repair being satisfactory is 0.41. What is the probability of a repair being late and unsatisfactory? (8 marks)

3. The weather on a particular day is classified as either cold, warm, or hot. There is a probability of 0.15 that it is cold and a probability of 0.25 that it is warm. In addition, on each day it may either rain or not rain. On cold days there is a probability of 0.30 that it will rain, on warm days there is a probability of 0.40 that it will rain, and on hot days there is a probability of 0.50 that it will rain. If it is not raining on a particular day, what is the probability that it is cold? (12 marks)

4. Suppose that the random variable X is the time taken by a garage to service a car. These times are distributed between 0 and 10 hours with a cumulative distribution function $F(x) = A + B \ln(3x + 2)$, for $0 \leq x \leq 10$.
 (a) Find the values of A and B and sketch the cumulative distribution function.
 (b) What is the probability that a repair job takes longer than two hours?
 (c) Construct the probability density function. (15 marks)

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
1	1	1	1			15
2	2	2	1,3			8
3	2	2	1,3			12
4	3	3	1,2			15



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 8

Date of Exam: 15-02-2023 (AN)

Duration: 90 min

Total Marks: 50 (C2)

Instructions:

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

Q1. Find the mean, median and mode of age of the people (in years) for the following data:

Age (in years)	20-30	30-40	40-50	50-60	60-70
No. of people	3	5	20	10	5

(5+5+5=15M)

Q2. From a deck of 52 cards, 3 cards are drawn successively, without replacement. The first card drawn is a red queen, the second card is a 9 or a king and the third card is greater than 4 but less than 8. Assuming that the occurrence of these three events are dependent on each other, find the probability of these three events occurring simultaneously. (5M)

Q3. Assume that four food inspectors at D-mart are performing the task of stamping the expiry date on each packet of food products. Varun, who stamps 20% of the packets, fails to stamp the expiry date once in every 200 packets; Shyam, who stamps 60% of the packets, fails to stamp the expiry date once in every 100 packets; Raghavi, who stamps 15% of the packets, fails to stamp the expiry date once in every 90 packets, and Puja, who stamps 5% of the packets, fails to stamp the expiry date once in every 200 packets. If a customer makes a complaint that one of his/her packets does not show the expiry date, what is the probability that it was inspected by:

- (a) Varun?
- (b) Shyam?
- (c) Raghavi?

(5+5+5=15)

Q4. The amount of time in hours that a semi-conductor device works before breaking down is a continuous random variable having probability density function defined by:

$$f(x) = \begin{cases} \frac{-x}{\lambda e^{100}} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

- (a) Find the value of λ .

Find the probability that

- (b) the device will work between 50 and 150 hours before breaking down.

- (c) It will work for less than 100 hours.

(5+5+5=15M)



QUESTION PAPER

Name of the Examination: CAT-1 (Winter 2022-2023)

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 10

Date of Exam: 13-02-2023 (Fn)

Duration: 90 min

Total Marks: 50

(A1)

Instructions: Answer all the questions.

Q1. (a) The arithmetic mean of 100 observations is 40. It is found that an observation 53 was misread as 83. Find the correct mean. 5M

(b) For the following frequency data, median is 38.5 and the total frequency is 400.

Class	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	42	38	A	54	B	36	32

Find A and B. 10M

Q2. Two dice are thrown independently. Three events A: odd face on first dice, B: odd face on second dice and C: sum of faces is odd. Explain in details whether the events A, B and C are (i) pairwise independent (ii) mutually independent. 10M

Q3. Factory A produces 1000 toys of which 20 are defective, factory B produces 4000 toys of which 40 are defective and factory C produces 5000 toys of which 50 are defective. All these toys from the three factories are put together in a stockpile. One of the toys was chosen from stockpile and is found to be defective. What is the probability that it is from (i) factory A (ii) factory B (iii) factory C. 10M

Q4. The time taken, X in minutes, for certain bacteria to split into two distinct bacteria, is believed to follow a continuous probability distribution, with probability density function as:

$$f(x) = \begin{cases} 3x^2, & 0 \leq x \leq 1 \\ 0, & \text{otherwise.} \end{cases}$$

Assuming this model is correct, calculate the median time it takes for a bacteria to split into two. Hint: Median is the value b such that $P(X \leq b) = P(X > b)$. 5M

Q5. A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7	8
P(x)	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$

Determine the value of a , mean, variance and cumulative distribution function. 10M



Name of the Examination: WIN 2023 CAT1

Course Code: MAT1011 Course Title: Applied Statistics

Set Number: 11 Date of Exam: 17-02-2023 (AN)

Duration: 90 mins Full Marks: 50 marks (E2)

Instructions: Answer all questions and assume data wherever necessary.

1. Find the mean, median, mode(by combined formula) from the following data.

class groups	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
frequencies	5	9	13	21	20	15	8	3

[5+5+5=15]

2. The probability that an American industry will locate in Shanghai, China is 0.7, the probability that that it will locate in Beijing, China is 0.4 and the probability that it will locate in either in Shanghai or Beijing or both is 0.8. What is the probability that the industry will locate

- (a) in both cities?
- (b) in neither city?
- (c) in Shanghai but not in Beijing?

[10]

3. A construction company employs two sales engineers. Engineer1 does the work of estimating cost for 70% of the jobs bid by the company. Engineer 2 does the work for 30% of jobs bid by the company. It is known that the error rate for engineer1 is such that 0.02 is the probability of an error when he does the work, whereas the probability of an error in the work of engineer2 is 0.04. Suppose a bid arrives and a serious error occurs in estimating cost. Which engineer would you guess did the work? Explain and show all work.

[10]

4. Let X be the possible number of defective computers purchased by the school, which has a probability distribution $f(x) = c(x^2 + 4)$, for $x = 0, 1, 2, 3$.

- (a) Find the value of the constant c .
- (b) Find the cumulative distribution function.
- (c) Find $P(X \geq 0)$.
- (d) Evaluate the expectation of $g(X) = 2 + 3X^2$.

[7]

5. On a laboratory assignment, if the equipment is working, the density function of the observed outcome, X is

$$f(x) = \begin{cases} k(1-x), & 0 < x < 1 \\ 0, & \text{otherwise.} \end{cases}$$

- (a) Find the value of k .
- (b) Find the cumulative distribution function.
- (c) Given that $X \geq 0.5$, what is the probability that X will be less than 0.75?

[8]



QUESTION PAPER

Name of the Examination: CAT-1 (WINTER 2022-2023)

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 12

Date of Exam: 17-02-2023 (FN)

Duration: 90 min

Total Marks: 50 (E1)

Q1. Find Mean, Median and Mode to the following data (15M)

Profit per Shop	0-10	10-20	20-30	30-40	40-50	50-60
No. of Shops	12	18	27	20	17	6

Q2. Ram hits the target 4 times in 7 shots, Priya hits 3 times in 7 shots and Gagan hits 3 times in 4 shots. What is the probability that (i) the target being hit by all (ii) nobody cannot hit by the target (iii) at least one will hit the target. (10M)

Q3. Box 1 contains three defective and seven non-defective items and box 2 contains one defective and nine non-defective items. We select a box at random and then draw one item at random from the box. What is the probability that box 1 was chosen, given a defective item is drawn. (10M)

Q4. (i) A random variable X has the following probability function

Values of X	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

Find the value of k and calculate the mean and variance. (8M)

(ii) A petrol pump is supplied with petrol once a day. If its daily volume of sales X in thousands of liters is distributed by $f(x) = 5(1-x)^4$, $0 < x < 1$. What must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01? (7M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			15
Q2	2	2	1,3			10
Q3	2	6	1,6			10
Q4	3	3	1,2			15



Name of the Examination: CAT 1 (Winter Sem. 2022-23)

Corse Code: MAT1011

Course Title: Applied Statistics

Set number: 5

Date of exam: 13-02-2023 (AN)

Duration: 90 minutes

Total marks: 50 (A2)

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 51 buildings near the peripheral area of Vijayawada airport:

Height (in cm)	135-140	140-145	145-150	150-155	155-160	160-165
No. of buildings	4	7	18	11	6	5

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

15 Marks

Q (2)

A witness to a crime scene briefly notices the convict who escaped. While enquired, the witness says the convict person is a female. Testing the witness under similar conditions shows the witness correctly identifies gender of a person 80% of the time. According to the current population survey, 90% people of the city are male and 10% are female.

Using Bayes' theorem, find the probability that the escaped person was actually female?

10 Marks

Q (3)

The probability that a married man watches a certain television show is 0.4, and the probability that a married woman watches the show is 0.5. The probability that a man watches the show, given that his wife does, is 0.7.

Find the probability that;

- i. a married couple watches the show
- ii. a wife watches the show, given that her husband does
- iii. at least one member of a married couple will watch the show.

10 Marks

Q (4)

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,

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

- i. Find the cumulative distribution function $F(x)$.
- ii. Use $F(x)$ to determine the probability that the winning bid is less than the person's preliminary estimation a .

15 Marks

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1,3			15
Q2	2	1	1,3			10
Q3	2	1	1,3			10
Q4	3	2	1,2			15



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT 1011

Course Title: Applied Statistics

Set number: 9

Date of Exam: 20-02-2023 (AN)

Duration: 90 min

Total Marks: 50

(G2)

Instructions:

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

Q1. A)

The frequency distribution of weights of sorghum ear-heads is given below:

Weight of Earheads (in g)	20-25	25-30	30-35	35-40	40-45	45-50
No. of Earheads	110	170	80	45	40	35

Find the Arithmetic Mean, Median and Mode for this frequency distribution.

B) Ramesh stocks Rs. 5000 worth of an item at the beginning of every month. Unit rate (in Rs.) of the item for five successive months had been 10.75, 11.80, 14.00, 11.45 and 12.00. Find the average rate per unit of the item he has stocked for five months.

(10M+5M)

Q2. A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, and 3 are used for 30%, 20%, and 50% of the products, respectively. The defect rate is different for the three plans. Probability of defective product using plan 1 is 1%, using plan 2 is 3% and using plan 3 is 2%. If a random product was observed and found to be defective, which plan was most likely used and what is the probability?

(8M)

Q3. In my town, it's rainy one third of the days. Given that it is rainy, there will be heavy traffic with probability $\frac{1}{2}$, and given that it is not rainy, there will be heavy traffic with probability $\frac{1}{4}$. If it's rainy and there is heavy traffic, I arrive late for work with probability $\frac{1}{2}$. On the other hand, the probability of being late is reduced to $\frac{1}{8}$ if it is not rainy and there is no heavy traffic. In other situations (rainy and no traffic, not rainy and traffic) the probability of being late is 0.25. You pick a random day.
a) What is the probability that it's not raining and there is heavy traffic and I am late?
b) What is the probability that I am late?
c) Given that I arrived late at work, what is the probability that it rained that day?

(12M)

Q4. A) Let X be a random variable with probability distribution function given by

$$f(x) = \begin{cases} cx^2 & |x| \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

- a) Find the constant c.
- b) Find E(X) and Var(X)
- c) Find P(X ≥ $\frac{1}{2}$).

B) Let X be a continuous random variable with probability distribution function given by

$$f(x) = \frac{1}{2}e^{-|x|}, \text{ for all } x \in R$$

If Y = X², find the cumulative distribution function of Y.

(10M+5M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	Marks
Q1	1	1	1	15
Q2	2	2	1,3	8
Q3	2	2	1,2	12
Q4	3	3	3	15



VIT-AP UNIVERSITY

QUESTION PAPER

Name of the Examination: WINTER SEM (2022-23) CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set Number: 13

Date of Exam: 16-02-2023 (AN)

Duration: 90 Minutes

Total Marks: 50 (02)

Instructions:

- Answer all the questions.
 - Assume data wherever necessary. Any assumptions made should be clearly stated.
1. (a) The points scored by a Pro-Kabaddi team in a series of matches are as follows:

17, 2, 7, 27, 15, 5, 14, 8, 10, 24, 48, 10, 8, 7, 18, 28

Find the mean, median and mode of the points scored by the team. (5 Marks)

- (b) Thirty students in a class were asked about the number of hours they played mobile games in the previous week. The results were found as follows:

1	6	2	3	5	12	5	8	4	8	10	3	4	12	2
8	15	1	17	6	3	2	8	5	9	6	8	7	14	12

Make a grouped frequency distribution table for this data, taking class interval width 5. Find the mean, median, mode of the time spent by the students in playing mobile games. (10 Marks)

2. 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
- smokes but does not drink alcoholic beverages;
 - eats between meals and drinks alcoholic beverages but does not smoke;
 - neither smokes nor eats between meals.
- (10 Marks)
3. A certain form of cancer is known to be found in women over the age of 60 with probability 0.07. A blood test exists for the detection of the disease, but the test is not infallible. In fact, it is known that 10% of the time the test gives a false negative (i.e., the test incorrectly gives a negative result) and 5% of the time the test gives a false positive (i.e., incorrectly gives a positive result). If a woman over 60 years of age is known to have taken the test and received a favorable (i.e., negative) result, what is the probability that she has the disease? (10 Marks)

4. (a) Six men and five women apply for an executive position in a small company. Two of the applicants are selected for interview. Let X denote the number of women in the interview pool. The probability mass function (PMF) of X is given by:

x	0	1	2
$f(x)$	$3/11$	$6/11$	$2/11$

How many women do you expect in the interview pool? That is, what is the expected value of X ? (7 Marks)

- (b) A commuter train arrives punctually at a station every half hour. Each morning, a commuter named John leaves his house and casually strolls to the train station. Let X denote the amount of time, in minutes, that John waits for the train from the time he reaches the train station. It is known that the probability density function (PDF) of X is

$$f(x) = \begin{cases} \frac{1}{30}, & \text{for } 0 < x < 30 \\ 0, & \text{otherwise.} \end{cases}$$

Obtain and interpret the expected value of the random variable X .

(8 Marks)

CO-PO Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	CO1	PO1	-	-	15
Q2	2	CO2	PO1,PO3	-	-	10
Q3	2	CO2	PO1,PO3	-	-	10
Q4	3	CO3	PO1,PO2	-	-	15



QUESTION PAPER

Name of the Examination: Fast Track Fall 2023-2024 Semester – CAT

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 2

Date of Exam: 05/07/2023 (An)

Duration: 90 min

Total Marks: 50

(C2)

Q1. Find Mean, Median and Mode to the following data (15M)

Data used in TB's	0-8	8-16	16-24	24-32	32-40
No. of Users	2	18	22	6	2

Q2. The probability that a contractor will get a plumbing contract is $\frac{2}{3}$, and the probability that he will not get an electric contract is $\frac{5}{9}$. If the probability of getting at least one contract is $\frac{4}{5}$, what is the probability that he will get both the contracts? (7M)

Q3. In a steel factory machines P, Q and R manufacture 30%, 10% and 60% of the total products out of which 5%, 3% and 3% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured by a machine P? (8M)

Q4. The probability distribution of a random variable X is given below (10M)

x	-2	-1	0	1	2
P(x)	0.2	0.1	0.3	0.3	0.1

Find Mean and Variance of the random variable X.

Q5. If a private bank received on the average 7 bad cheques per day, find the probability that it will receive (i) 4 bad cheques on any given day (ii) more-than 4 bad cheques on any given day (10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1	-	-	15
Q2	2	1,2	1,3	-	-	7
Q3	2	1,2	1,3	-	-	8
Q4	3	1,3	1,2	-	-	10
Q5	3	1,3	1,2	-	-	10



QUESTION PAPER

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

Course Code: MAT 1011

Course Title: Applied Statistics

Set number: 03

Date of Exam: 14/09/2023 (PN) (E)

Duration: 90 min

Total Marks: 50

Instructions:

1. Any assumptions made should be clearly stated.

Q1. An incomplete distribution is given below

Variable	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	12	30	x	65	y	25	18

You are given that median value as 46 and the total number of items is 230.

(a) Find the frequencies of x and y , (b) Find the mean and mode of the distribution.

(15M)

Q2.

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

(15M)

Q3.

The duration of time (minutes) for newspaper reading for a person is a random event, with probability density function

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

- (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 person will take to read a newspaper is more than 10 minutes?

(10M)

Q4.

In each sample from a locality, there is 10% chance of containing COVID-19 positive cases. Assume that the samples from that locality, are independent with regard to the presence of the positive cases. Find the probability that in the next 18 samples, exactly 2 contain the positive cases. Determine the probability that at least 4 samples contain the positive cases.

(10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			15
Q2	2	2	1			15
Q3	3	3	2			10
Q4	3	3	2			10



QUESTION PAPER

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

Course Code: MAT 1011

Course Title: Applied Statistics

Set number: 04

Date of Exam: 12/09/2023 (FN) (C)

Duration: 90 min

Total Marks: 50

Instructions:

1. Any assumptions made should be clearly stated.

Q1. The median of the distribution given below is 14.4. 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

(15M)

Q2.

a) Suppose we have 3 cards identical in form except that both sides of the first card are coloured red, both sides of the second card are coloured black, and one side of the third card is coloured red and the other side is coloured black.

The 3 cards are mixed up in a hat, and 1 card is randomly selected and put down on the ground. If the upper side of the chosen card is red, what is the probability that the other side is coloured black?

b) An instructor 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?

(10+5M)

Q3.

A food supply company produces 850 food packages daily, and out of that 50 such packages do not serve customers' needs. Two packages are selected at random without replacement from daily production, where, $P(X = 0) = 0.886$, $P(X = 1) = 0.111$, $P(X = 2) = 0.003$, X – number of package which does not serve customers' need. Find the cumulative distribution function.

(10M)

Q4.

In an aluminium wire between two electricity poles, it is found the bad sectors with a mean of 2.3 in every 1 meter length. What is the probability of exactly two bad sectors in 1 meter length? Further, find the probability of 10 bad sectors in 5 meters of the wire.

(10M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			15
Q2	2	2	1			15
Q3	3	3	2			10
Q4	3	3	2			10



QUESTION PAPER

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

Course Code: MAT1011

Course Title: Applied Statistics

Set number: 06

Date of Exam: 12/09/2023 (A1) (C2)

Duration: 90 Min

Total Marks: 50

Instructions:

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

Q1. If the mean of the following data is 28. Then find the missing frequency R and calculate the median and mode of the distribution. **[15M]**

Class group	0-10	10-20	20-30	30-40	40-50	50-60
Frequencies	12	18	27	R	17	6

Q2. A company has two plants to manufacture TVs. The first plant manufactures 70% of the TV and the rest are manufactured by the other plant. 80% of the TVs manufactured by the first plant are rated of standard quality, while that of the second plant only 70% are of standard quality. If a TV chosen at random is found to be of standard quality, find the following probabilities by using the Bayes theorem: **[15M]**

- that it was produced by the first plant.
- that it was produced by the second plant.

Q3. Let X be a discrete random variable with the following PMF **[10M]**

$$P_X(k) = \begin{cases} 0.1 & \text{for } k = 0 \\ 0.4 & \text{for } k = 1 \\ 0.3 & \text{for } k = 2 \\ 0.2 & \text{for } k = 3 \\ 0 & \text{otherwise} \end{cases}$$

- Find the mean and variance of X.
- Find E(Y) where $Y = (X - 2)^2$

Q4. A fair coin is tossed 15 times, find the following probabilities **[10M]**

- What is the probability of getting exactly 8 tails?
- What is the probability of getting less than 10 tails?

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1	2	1	15
Q2	2	2	1	2	1	15
Q3	3	3	1	2	1	10
Q4	3	3	4	-	1	10



Name of the Examination: WIN 2023 CAT1

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

Set Number:

Date of Exam:

Duration: 90 mins

Full Marks: 50 marks

Instructions: Answer all questions and assume data wherever necessary.

1. Find the mean, median, mode(by combined formula) from the following data.

class groups	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
freqencies	5	9	13	21	20	15	8	3

[5+5+5=15]

2. The probability that an American industry will locate in Shanghai, China is 0.7, the probability that that it will locate in Beijing, China is 0.4 and the probability that it will locate in either in Shanghai or Beijing or both is 0.8. What is the probability that the industry will locate
 (a) in both cities?
 (b) in neither city?
 (c) in Shanghai but not in Beijing? [10]

3. A construction company employs two sales engineers. Engineer1 does the work of estimating cost for 70% of the jobs bid by the company. Engineer 2 does the work for 30% of jobs bid by the company. It is known that the error rate for engineer1 is such that 0.02 is the probability of an error when he does the work, whereas the probability of an error in the work of engineer2 is 0.04. Suppose a bid arrives and a serious error occurs in estimating cost. Which engineer would you guess did the work? Explain and show all work. [10]

4. Let X be the possible number of defective computers purchased by the school, which has a probability distribution $f(x) = c(x^2 + 4)$, for $x = 0, 1, 2, 3$.
 (a) Find the value of the constant c .
 (b) Find the cumulative distribution function.
 (c) Find $P(X \geq 0)$.
 (d) Evaluate the expectation of $g(X) = 2 + 3X^2$. [7]

5. On a laboratory assignment, if the equipment is working, the density function of the observed outcome, X is

$$f(x) = \begin{cases} k(1 - x), & 0 < x < 1 \\ 0, & \text{otherwise.} \end{cases}$$

- (a) Find the value of k .
 (b) Find the cumulative distribution function.
 (c) Given that $X \geq 0.5$, what is the probability that X will be less than 0.75? [8]

QP mapping

Question no.	Module no.	CO	PO	PEO	PSO	Marks
1	1	1	1	-	-	15
2	2	2	1,3	-	-	10
3	2	2	1,3	-	-	10
4	3	3	1,2	-	-	7
5	3	3	1,2	-	-	8

————— End —————



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 min

Total Marks: 50

Instructions:

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

Q1. Find the mean, median and mode of age of the people (in years) for the following data:

Age (in years)	20-30	30-40	40-50	50-60	60-70
No. of people	3	5	20	10	5

(5+5+5=15M)

Q2. From a deck of 52 cards, 3 cards are drawn successively, without replacement. The first card drawn is a red queen, the second card is a 9 or a king and the third card is greater than 4 but less than 8. Assuming that the occurrence of these three events are dependent on each other, find the probability of these three events occurring simultaneously. **(5M)**

Q3. Assume that four food inspectors at D-mart are performing the task of stamping the expiry date on each packet of food products. Varun, who stamps 20% of the packets, fails to stamp the expiry date once in every 200 packets; Shyam, who stamps 60% of the packets, fails to stamp the expiry date once in every 100 packets; Raghavi, who stamps 15% of the packets, fails to stamp the expiry date once in every 90 packets, and Puja, who stamps 5% of the packets, fails to stamp the expiry date once in every 200 packets. If a customer makes a complaint that one of his/her packets does not show the expiry date, what is the probability that it was inspected by:

- (a) Varun?
- (b) Shyam?
- (c) Raghavi?

(5+5+5=15)

Q4. The amount of time in hours that a semi-conductor device works before breaking down is a continuous random variable having probability density function defined by:

$$f(x) = \begin{cases} \lambda e^{\frac{-x}{100}} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

- (a) Find the value of λ .
- Find the probability that
- (b) the device will work between 50 and 150 hours before breaking down.
- (c) it will work for less than 100 hours.

(5+5+5=15M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			15
Q2	2	2	1,3			05
Q3	2	2	1,3			15
Q4	3	3	1,2			15



QUESTION PAPER

Name of the Examination: CAT-1 (WINTER 2022-2023)

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 min

Total Marks: 50

Q1. Find Mean, Median and Mode to the following data **(15M)**

Profit per Shop	0-10	10-20	20-30	30-40	40-50	50-60
No. of Shops	12	18	27	20	17	6

Q2. Ram hits the target 4 times in 7 shots, Priya hits 3 times in 7 shots and Gagan hits 3 times in 4 shots. What is the probability that (i) the target being hit by all (ii) nobody cannot hit by the target (iii) at least one will hit the target. **(10M)**

Q3. Box 1 contains three defective and seven non-defective items and box 2 contains one defective and nine non-defective items. We select a box at random and then draw one item at random from the box. What is the probability that box 1 was chosen, given a defective item is drawn. **(10M)**

Q4. (i) A random variable X has the following probability function

Values of X	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

Find the value of k and calculate the mean and variance. **(8M)**

(ii) A petrol pump is supplied with petrol once a day. If its daily volume of sales X in thousands of liters is distributed by $f(x) = 5(1-x)^4$, $0 < x < 1$. What must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01? **(7M)**

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			15
Q2	2	2	1,3			10
Q3	2	6	1,6			10
Q4	3	3	1,2			15



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT 1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 min

Total Marks: 50

Instructions:

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

Q1. A)

The frequency distribution of weights of sorghum ear-heads is given below:

Weight of Earheads (in g)	20-25	25-30	30-35	35-40	40-45	45-50
No. of Earheads	110	170	80	45	40	35

Find the Arithmetic Mean, Median and Mode for this frequency distribution.

B) Ramesh stocks Rs. 5000 worth of an item at the beginning of every month. Unit rate (in Rs.) of the item for five successive months had been 10.75, 11.80, 14.00, 11.45 and 12.00. Find the average rate per unit of the item he has stocked for five months.

(10M+5M)

Q2. A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, and 3 are used for 30%, 20%, and 50% of the products, respectively. The defect rate is different for the three plans. Probability of defective product using plan 1 is 1%, using plan 2 is 3% and using plan 3 is 2%. If a random product was observed and found to be defective, which plan was most likely used and what is the probability?

(8M)

Q3. In my town, it's rainy one third of the days. Given that it is rainy, there will be heavy traffic with probability $\frac{1}{2}$, and given that it is not rainy, there will be heavy traffic with probability $\frac{1}{4}$. If it's rainy and there is heavy traffic, I arrive late for work with probability $\frac{1}{2}$. On the other hand, the probability of being late is reduced to $\frac{1}{8}$ if it is not rainy and there is no heavy traffic. In other situations (rainy and no traffic, not rainy and traffic) the probability of being late is 0.25. You pick a random day.

- a) What is the probability that it's not raining and there is heavy traffic and I am not late?
- b) What is the probability that I am late?
- c) Given that I arrived late at work, what is the probability that it rained that day?

(12M)

Q4. **A)** Let X be a random variable with probability distribution function given by

$$f(x) = \begin{cases} cx^2 & |x| \leq 1 \\ 0 & elsewhere \end{cases}$$

- a) Find the constant c.
- b) Find E(X) and Var(X)
- c) Find P (X ≥ $\frac{1}{2}$).

B) Let X be a continuous random variable with probability distribution function given by

$$f(x) = \frac{1}{2}e^{-|x|}, \text{ for all } x \in R$$

If Y = X², find the cumulative distribution function of Y.

(10M+5M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	Marks
Q1	1	1	1	15
Q2	2	2	1,3	8
Q3	2	2	1,2	12
Q4	3	3	3	15



Name of the Examination: CAT 1 (Winter Sem. 2022-23)

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of exam:

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 51 buildings near the peripheral area of Vijayawada airport:

Height (in cm)	135-140	140-145	145-150	150-155	155-160	160-165
No. of buildings	4	7	18	11	6	5

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

15 Marks

Q (2)

A witness to a crime scene briefly notices the convict who escaped. While enquired, the witness says the convict person is a female. Testing the witness under similar conditions shows the witness correctly identifies gender of a person 80% of the time. According to the current population survey, 90% people of the city are male and 10% are female.

Using Bayes' theorem, find the probability that the escaped person was actually female?

10 Marks

Q (3)

The probability that a married man watches a certain television show is 0.4, and the probability that a married woman watches the show is 0.5. The probability that a man watches the show, given that his wife does, is 0.7.

Find the probability that;

- i. a married couple watches the show
- ii. a wife watches the show, given that her husband does
- iii. at least one member of a married couple will watch the show.

10 Marks

Q (4)

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,

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

- i. Find the cumulative distribution function $F(x)$.
- ii. Use $F(x)$ to determine the probability that the winning bid is less than the person's preliminary estimation a .

15 Marks

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1,3			15
Q2	2	1	1,3			10
Q3	2	1	1,3			10
Q4	3	2	1,2			15



QUESTION PAPER

Name of the Examination: CAT1 (Winter 2022-2023)

Course Code: MAT1011

Course Title: Applied Statistics

Set

Date of Exam:

Duration: 90 min

Total Marks: 50

Instructions:

- Assume data wherever necessary.
 - Any assumptions made should be clearly stated.
1. The given random data set is: 46, 11, 12, 18, 52, 45, 44, 14, 18, 44, 33, 51, 32, 22, 21, 23, 15, 16, 29, 41, 42, 43, 47, 52, 53, 55, 57, 34, 35, 25.

Now solve the following questions:

[08M+08M]

- I. Find the Mean, Median, and Mode of the given data set. Also, interpret your observation by comparing the above results.
- II. Transform the given data set into a group data set by considering the first class interval will be (10-20). Then, find the Median for the group data. Compare the median for the discrete data with the group data and suggest which one is more accurate.

2. Two National parties are competing for the PM position in India. The probability that the Congress party and the BJP party will win are 0.7 and 0.3 respectively. Further, if the congress party wins, the probability of introducing a new product is 0.6 and the corresponding probability is 0.4 if BJP wins. Therefore, find the probability that the new product was introduced by BJP if they win the election. **[10M]**

3. Four cards are drawn from a pack of cards, Find the probability that
 - I. That all are diamonds.
 - II. There are two spades and two hearts.**[10M]**

4. A random variable has a density function **[14M]**

$$f(x) = \begin{cases} 0 & 0 < x \\ x^3 & 0 \leq x < 1 \\ Rx & 1 \leq x < 2 \\ x^2 & 2 \leq x < 3 \\ 0 & 3 \geq x \end{cases}$$

A) Find the Constant R.
 B) Find the P(1 < x < 3)
 C) Find P(x < 3)
 D) Find P(x > 2)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	CO1	PO1			16
Q2	2	CO2	PO1, PO3			10
Q3	2	CO2	PO1, PO3			10
Q4	3	CO3	PO1, PO2			14



QUESTION PAPER
Name of the Examination: CAT-1 (Winter 2022-2023)

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 min

Total Marks: 50

Instructions: Answer all the questions.

Q1. (a) The arithmetic mean of 100 observations is 40. It is found that an observation 53 was misread as 83. Find the correct mean. **5M**

(b) For the following frequency data, median is 38.5 and the total frequency is 400.

Class	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	42	38	A	54	B	36	32

Find A and B.

10M

Q2. Two dice are thrown independently. Three events A: odd face on first dice, B: odd face on second dice and C: sum of faces is odd. Explain in details whether the events A, B and C are (i) pairwise independent (ii) mutually independent. **10M**

Q3. Factory A produces 1000 toys of which 20 are defective, factory B produces 4000 toys of which 40 are defective and factory C produces 5000 toys of which 50 are defective. All these toys from the three factories are put together in a stockpile. One of the toys was chosen from stockpile and is found to be defective. What is the probability that is from (i) factory A (ii) factory B (iii) factory C. **10M**

Q4. The time taken, X in minutes, for certain bacteria to split into two distinct bacteria, is believed to follow a continuous probability distribution, with probability density function as:

$$f(x) = \begin{cases} 3x^2, & 0 \leq x \leq 1 \\ 0, & \text{otherwise.} \end{cases}$$

Assuming this model is correct, calculate the median time it takes for a

bacteria to split in to two. Hint: Median is the value b such that $P(X \leq b) = P(X > b)$. **5M**

Q5. A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7	8
P(x)	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$

Determine the value of a , mean, variance and cumulative distribution function.

10M

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	CO1	PO1			15
Q2	2	CO2	PO1, PO3			10
Q3	2	CO2	PO1, PO3			10
Q4	3	CO3	PO1, PO2			5
Q5	3	CO3	PO1, PO2			10



Name of the Examination: WINTER 2022-2023-CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 min

Total marks: 50

Instructions:

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

1. A stopwatch was used to find the time that it took a group of students to run 100 m.

Time (seconds)	10-15	15-20	20-25	25-30	30-35
Frequency	5	12	18	13	2

- (a) Estimate the median.
 (b) Estimate the mean.
 (c) Is the median in the modal class?
 (d) Is the median greater or less than the mean? **(15 marks)**

2. A car repair can be performed either on time or late and either satisfactorily or unsatisfactorily. The probability of a repair being on time and satisfactory is 0.26. The probability of a repair being on time is 0.74. The probability of a repair being satisfactory is 0.41. What is the probability of a repair being late and unsatisfactory? **(8 marks)**

3. The weather on a particular day is classified as either cold, warm, or hot. There is a probability of 0.15 that it is cold and a probability of 0.25 that it is warm. In addition, on each day it may either rain or not rain. On cold days there is a probability of 0.30 that it will rain, on warm days there is a probability of 0.40 that it will rain, and on hot days there is a probability of 0.50 that it will rain. If it is not raining on a particular day, what is the probability that it is cold? **(12 marks)**

4. Suppose that the random variable X is the time taken by a garage to service a car. These times are distributed between 0 and 10 hours with a cumulative distribution function $F(x) = A + B \ln(3x + 2)$, for $0 \leq x \leq 10$.

(a) Find the values of A and B and sketch the cumulative distribution function.
 (b) What is the probability that a repair job takes longer than two hours?
 (c) Construct the probability density function. **(15 marks)**

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
1	1	1	1			15
2	2	2	1,3			8
3	2	2	1,3			12
4	3	3	1,2			15

QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 minutes

Total Marks: 50

Instructions:

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

Q1. The weight of the 40 college students at state university are given in the following table:

Weight	118-126	127-135	136-144	145-153	154-162	163-171	172-180
Number of students	3	5	9	12	5	4	2

Compute arithmetic mean, median, mode for the given data. **(15M)**

Q2. For married couples living in a certain suburb, the probability that the husband will vote on a bond referendum is 0.21, the probability that the wife will vote on the referendum is 0.28, and the probability that both the husband and the wife will vote is 0.15. What is the probability that (a) at least one member of a married couple will vote?

(b) A wife will vote, given that her husband will vote?

(c) A husband will vote, given that his wife will not vote? **(10M)**

Q3. A large firm has 85% of its service calls made by a contractor, and 10% of these calls result in customer complaints. The other 15% of the service calls are made by their own employees, and these calls have a 5% complaint rate.

(a) Find the probability of receiving a complaint.

(b) Find the probability that the complaint was from a customer serviced by the contractor.

(10M)

Q4. Suppose the measurement error X of a certain physical quantity is decided by the density function

$$f(x) = \begin{cases} k(3 - x^2), & -1 \leq x \leq 1, \\ 0, & \text{elsewhere.} \end{cases}$$

(a) Determine k that renders $f(x)$ a valid density function.

(b) Find the probability that the error in measurement is less than 1/2. **(10M)**

Q5. Suppose that the number of cars X that pass through a car wash between 4:00 P.M. and 5:00 P.M. on any sunny Friday has the following probability distribution:

X	4	5	6	7	8	9
$P(X = x)$	1/12	1/12	1/4	1/4	1/6	1/6

Let $g(X) = 2X - 1$ represent the number of attendants needed by the manager for a car wash. Find the expected number of attendants required for car wash between this particular time period. **(5M)**

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	CO1	PO1			15
Q2	2	CO2	PO1, PO3			10
Q3	2	CO2	PO1, PO3			10
Q4	3	CO3	PO1, PO2			10
Q5	3	CO3	PO1, PO2			5



QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 min

Total Marks: 50

Instructions: -

- 1) The question paper contains four questions.**
- 2) All questions are compulsory.**
- 3) The number of marks carried by a question/part is indicated against it.**

Q.1: The frequency distribution of number of grains per earhead on 50 wheat earheads is given below:

Classes	4-10	10-16	16-22	22-28	28-34	34-40	40-46
Frequency	2	4	10	18	8	5	3

Calculate the mean, median and mode value of this distribution.

(15 M)

Q.2: In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B?

(10 M)

Q.3: Two machines are in operation. Machine A produces 60% of the items whereas machine B produces the remaining 40%. Machine A produces 4% defective items whereas machine B produces 5% defective items. An item is chosen at random, find the probability that it is defective.

(10 M)

Q.4: Let X be a random variable with probability density function as

$$f(x) = \begin{cases} \frac{x}{2}, & 0 < x \leq 1 \\ \frac{1}{2}, & 1 < x \leq 2 \\ \frac{3-x}{2}, & 2 < x < 3 \\ 0, & \text{elsewhere} \end{cases}$$

Find the Mathematical Expectation and Variance of the random variable X.

(15 M)

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	Marks
Q1	1	CO2	PO1, PO3	15
Q2	2	CO3	PO1, PO2	10
Q3	2	CO3	PO1, PO2	10
Q4	3	CO3	PO1, PO2	15



Name of the Examination: WINTER 2022-23-CAT-1

Course Code: MAT 1011

Course Title: Applied Statistics

Set Number:

Date of Examination:

Duration: 90 minutes

Total Marks: 50

1. If the median marks of 60 students from the distribution given below is 28.50.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of Students	5	x	20	15	y	5

(a) Find the value of x and y .

(b) Find the *mean* and *mode* of the above distribution.

7+9=16

2. A gene can be either type X or type Y , and it can be either dominant or recessive. If the gene is type Y , then there is a probability of 0.31 that it is dominant. There is also a probability of 0.22 that a gene is type Y and it is dominant. What is the probability that a gene is of type X ? **8**

3. A company sells four types of wheelchairs, with type A being 12% of the sales, type B being 34% of the sales, type C being 29% of the sales and type D being 25% of the sales. In addition, 19% of the type A wheelchair sales are motorized, 50% of the type B wheelchair sales are motorized, 32% of the type C wheelchair sales are motorized, and 76% of the type D wheelchair sales are motorized.

(a) If a motorized wheelchair is sold, what is the probability that it is of type C ?

(b) If a non-motorized wheelchair is sold, what is the probability that it is of type D ? **6+6=12**

4. The resistance X of an electrical component has a probability density function

$$f(x) = \begin{cases} Ax(130 - x^2) & 10 \leq x \leq 11 \\ 0 & \text{otherwise.} \end{cases}$$

(a) Calculate the value of the constant A .

(b) Calculate the cumulative distribution function.

(c) What is the probability that the electrical component has a resistance between 10.25 and 10.50? **4+4+6=14**

QP Mapping

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
1	1	1	1			16
2	2	2	1, 3			8
3	2	2	1, 3			12
4	3	3	1, 2			14

QUESTION PAPER

Name of the Examination: WINTER 2022-2023 – CAT-1

Course Code: MAT1011

Course Title: Applied Statistics

Set number:

Date of Exam:

Duration: 90 Min

Total Marks: 50

Instructions:

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

Q1. If the mean of the given frequency distribution is 35, then find the missing frequency k. Also, calculate the median and mode of the distribution. **(15M)**

Class	10-20	20-30	30-40	40-50	50-60
Frequency	2	4	7	k	1

Q2. A, B, C are aiming to shoot a balloon. A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that of C is 2 out 3. If the three aim the balloon simultaneously, then find the probability that at least two of them hit the balloon. **(8M)**

Q3. Of the three men, the chances that a politician, a business man or an academician will be appointed as a vice-chancellor (VC) of a university are 0.5, 0.3, 0.2 respectively. Probability that research is promoted by these persons if they are appointed as VC are 0.3, 0.7, 0.8 respectively.

a) Find the probability that research is promoted. **(6M)**

b) If the research is promoted, what is the probability that VC is an academician? **(6M)**

Q4. The diameter of an electric cable is assumed to be continuous random variable x with probability density function

$$f(x) = \begin{cases} 6x(1-x), & 0 \leq x < 1 \\ 0, & \text{otherwise} \end{cases}$$

a) Justify that $f(x)$ is a probability density function. **(5M)**

b) Find the mean and variance of the distribution. **(8M)**

c) Find $P(0 \leq x < 0.5)$ **(2M)**

QP MAPPING

Q. No.	Module Number	CO Mapped	PO Mapped	PEO Mapped	PSO Mapped	Marks
Q1	1	1	1			15
Q2	2	2	1,3			8
Q3	2	2	1,2			12
Q4	3	3	1,2			15