



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:IV
Class:SY	Program:B.Tech
Branch Code:ADS/COM/CSD/INT	Pattern:2022
Name of Course:Applied Mathematics-III	Course Code:SMH222111
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 3 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. Use of non programmable calculator is allowed.
6. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

- 1a) Calculate first four central moments of the following data: (6) CO1

x	0	1	2	3	4	5	6	7	8
f	1	2	9	16	24	16	9	2	1

Also find coefficient of skewness and kurtosis.

Question No. 2 Attempt following Question

- 2a) Find the value of k if pmf is given by (6) CO2

x	-3	-2	-1	0	1	2	3	4
p(x)	5k	4k ²	2k ²	5k-k ²	3k ²	2k	k	5k ²

Also find

- i. $P(|x| > 1)$
- ii. $P(-1 \leq X < 4)$

Question No. 3 Attempt following Question

- 3a) Given the following probability distribution of X (5) CO2

x	-3	-2	-1	0	1	2	3
p(x)	0.05	0.10	0.30	0	0.30	0.15	0.10

Compute:

- i. $E(X)$
- ii. $E(X^2)$
- iii. $E(2X \pm 3)$
- iv. $V(2X \pm 3)$

OR

- 3b) The cumulative distribution function of a r.v. is: (5) CO2

$$F(x) = 1 - (1 + x)e^{-x} \quad ; \quad x > 0$$

Find the probability density function of X, mean and variance.

- 3c) If X represents the outcome when a fair die is tossed. Find the moment generating function of X and hence find $E(X)$ and $E(X^2)$ (5) CO2

OR

- 3d) Find the MGF of the random variable whose probability function is $P(X = x) = \frac{1}{2^x}$; $x = 1, 2, 3, \dots$ (5) CO2

- 3e) Find $E(X), E(X^2)$ and $V(X)$ for the following probability distribution. (6) CO2

$$P(X = x) = \begin{cases} q^x p & , x = 0, 1, 2, \dots \\ 0 & \text{otherwise} \end{cases} \quad , \text{ where } q = 1 - p$$

OR

- 3f) Find $E(X), E(X^2)$ and $V(X)$ for the following probability density function. (6) CO2

$$f(x) = \begin{cases} \frac{1}{b-a} & ; a < x < b \\ 0 & \text{otherwise} \end{cases}$$

Question No. 4 Attempt following Question

- 4a) The probability of a man hitting a target is $\frac{1}{3}$. If he fires 5 times, what is the probability of his hitting the target at least twice. (5) CO4

OR

- 4b) An Unbiased coin is thrown 10 times, find the probability of getting exactly 6 heads, at least 6 heads. (5) CO4

- 4c) A car hire firm 2 cars which it hires day by day. The number of demands for the car on each day is distributed as Poisson distribution with parameter 1.5 Calculate the Probability of days on which neither car is used & for the days on which demand is refused. (5) CO4

OR

- 4d) A manufacturer of cotter pins knows that 2% of his product is defective. If he sells cotter pins in boxes of 100 pins and guarantees that not more than 5 pins will be defectives in a box, find the approximate probability that a box will fail to met the guaranteed quantity. (5) CO4

- 4e) In a certain examination test, 2000 students appeared in a subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks, supposing that marks are distributed normally? [$A(z=2)=0.4772$] (6) CO5

OR

- 4f) For a normal distribution when mean $\mu = 1, \sigma = 3$, find the probabilities for the intervals (6) CO5

i. $3.43 \leq X \leq 6.19$

ii. $1.42 \leq X \leq 6.19$ [$A(-1.72) = 0.4592, A(-0.81) = 0.2910$]

Question No. 5 Attempt following Question

- 5a) Calculate Karl Pearson's coefficient of correlation between expenditure on advertising and sales from the data given below: (5) CO3

Advertising expenses ('000Rs)	39	65	62	90	82	75	25	98	36	78
Sales(lakhs Rs)	47	53	58	86	62	68	60	91	57	84

OR

- 5b) Obtain correlation coefficient between population density (per square miles) and death rate (per thousand persons) from data related to 5 cities. (5) CO3

Population density	200	500	400	700	800
Death rate	12	18	16	21	10

- 5c) Quotations of index number of equity share price of a certain joint stock company and of prices of preference shares are given below: (5) CO3

Years	1991	1992	1993	1994	1995	1996	1997
Equity Shares	97.5	99.4	98.6	96.2	95.1	98.4	97.1
Preference Shares	75.1	75.9	77.1	78.2	79.0	74.8	76.2

Use the method of rank correlation to determine the relationship between equity share and preference share prices.

OR

- 5d) From the following data calculate the rank correlation coefficient after making adjustment for tied ranks (5) CO3

X	48	33	40	9	16	16	65	24	16	57
Y	13	13	24	6	15	4	20	9	6	19

- 5e) The following table gives the ages and blood pressure of 10 women. (6) CO3

Age(X)	56	42	36	47	49	42	60	72	63	55
Blood Pressure(Y)	147	125	118	128	145	140	155	160	149	150

Determine regression equation of Y on X and estimate the blood pressure of a woman whose age is 45 yrs.

OR

- 5f) Calculate the correlation coefficient from the following results (6) CO3

$$N = 10, \quad \sum X = 350, \quad \sum Y = 310, \quad \sum (X - 35)^2 = 162, \quad \sum (Y - 31)^2 = 222, \quad \sum (X - 35)(Y - 31) = 92$$

Also find the line of regression X on Y and Y on X.

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