

Time: 2½ hrs.

Note:

1. All questions are compulsory with internal choice.
2. Draw neat diagrams wherever necessary.
3. Figures to the right indicate full marks.
4. Use of scientific calculator fx 82 series and below is only allowed.

Q.1 Answer the following (any FOUR) (20)

- (a) It is observed that, if student works hard then chance of passing an exam is very high i.e., 80%. A random sample of such 10 students was selected. What is the chance that

- (i) No student will pass exam.
- (ii) 3 students will pass the exam.

- (b) A problem is given to three persons P, Q, R whose respective chances of solving it are $\frac{2}{7}$, $\frac{4}{7}$, $\frac{4}{9}$ respectively. What is the probability that the problem is solved?

- (c) For the following probability mass function of X

X	1	2	3	4	5	6
P(X=x)	$k - 2k^2$	$7k^2 + k - 1$	$\frac{k}{3}$	$1 - 2k$	$\frac{4k - 1}{3}$	$\frac{1 - k}{3}$

Find k. Hence find probability distribution of X

- (d) Let $f(x) = \begin{cases} \frac{x}{4} + C, & 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$, be probability density function.

Find C. Hence Find cumulative distribution function.

- (e) Write 5 properties of cumulative distribution function of a continuous random variable.

- (f) Let $P(A) = 0.5$, $P(B) = 0.7$, $P(A \cap B) = 0.3$, then find

- (i) $P(A \cup B)$, (ii) $P\left(\frac{A}{B}\right)$, (iii) $P\left(\frac{A^c}{B}\right)$

Q.2 Answer the following (any FOUR) (20)

- (a) If $E(X) = 3$ and $E(X^2) = 12$. Find the mean and variance of $Y = 2X - 3$.

- (b) Find the value of χ^2 for the following data

	Dead	Surviving	Total
Inoculated	2	10	12
Not-Inoculated	8	4	12
Total	10	14	24

- (c) For the following probability density function, $f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$. Find $E(X)$ & $V(X)$

- (d) 100 students of a class were given an aptitude test. Their marks were found to be normally distributed with mean 60 & standard deviation 5. Find number of students scored (i) more than 60 marks (ii) between 45 & 65 marks.

- (e) In a box of 100 bulbs, 20 are defective. If 10 bulbs are selected randomly, then find the probability that (i) at least 1 is defective, (ii) at most 1 is defective

- (f) For the following pmf of X

X	1	2	3	4	5
P(X=x)	k	3k	2k	k	5k

Find k & $E(X)$

Q.3

Answer the following (any **FOUR**)

(20)

- (a) In a sample of 100 store customers, 43 used a master card. In another sample of 100, 58 used a visa card. At a 0.05, is there a difference in the proportion of people who use each type of credit card?

- (b) A die was thrown 132 times and the following frequencies were observed.

No. obtained	1	2	3	4	5	6
Frequency	15	20	25	15	29	28

Test the hypothesis that the die is unbiased ($\chi^2_{tab} = 11.07$ @ 5% LOS for df = 5)

- (c) Find the value of H by Kruskal Wallis Test for the following table.

A	B	C
3.1	2.8	4.0
2.6	4.1	5.5
2.9	2.9	5.0
	3.4	4.8
	4.2	

- (d) Check whether the following run is random or not. AAABBAABBBBBAABBAAB

- (e) Following are the marks of some students in Mumbai University and Pune University

Mumbai	75	80	95	80	60	55	86	41	75
Pune	80	85	60	70	40	60	70	80	65

Do the median marks differ? Check at 5% level of significance. Use Mann Whitney U test.

- (f) By using sign test check whether there is difference in median of the following data:

Students	1	2	3	4	5	6	7	8	9	10	11	12
Marks before	3	2	3	2	1	3	2	3	2	1	3	2
Marks after	2	3	4	4	1	4	4	3	1	3	4	3

Q.4

Answer the following (any **FIVE**)

(15)

- (a) Let $P(X = x) = \begin{cases} \frac{k}{2^x} & , x = 0, 1, 2, 3, \dots \\ 0 & , \text{otherwise} \end{cases}$ be a pmf

Find i) k, ii) $P(X \geq 3)$

- (b) Find $E(X)$ & $V(X)$ for the following pmf

X	1	2	3	4	5
$P(X=x)$	1/12	3/12	5/12	1/20	1/5

- (c) Write a difference between parametric test and non-parametric test.

- (d) Write a short note on Type - I error & Type - II error

- (e) Let mean normal distribution is 69.6 with the SD 3. Find $P(X > 66)$.

- (f) Explain steps of testing of hypothesis.

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