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1507E562

Candidate's Seat No : _____

IM.Sc. (CS) Sem.-3 (A.T.K.T.) Examination

Statistical Foundation

Time : 3-00 Hours] **July-2024** **[Max. Marks : 70**

Instructions:

- Both Sections have equal weightage
- Make Assumptions wherever necessary

SECTION - I

Q.1 Attempt any one (11)

a) A student can enter a course either as a beginner or as a transferring student. It is found that 62% of beginners eventually graduate, and that 78% of transferring students eventually graduate. Are the events 'beginner student' and 'transferring student' independent, mutually exclusive or dependent?

b) For these situations, state which measure of central tendency—mean, median, or mode—should be used.

1. The most typical case is desired.
2. The distribution is symmetric.
3. There is an extreme value in the data set.

c) Two dice are rolled. What is the sample space for this experiment?

Q.2 Attempt any one (12)

a) The number of total vetoes exercised by the past 20 Presidents is listed below. Use the data to construct a grouped frequency distribution and a cumulative frequency distribution with 5 classes. What is challenging about this set of data?

44	39	37	21	31	170	44	635	30	78
42	6	250	43	10	82	50	181	66	37

b) The following values of fracture stress (in megapascals) were measured for a sample of 24 mixtures of hot-mixed asphalt (HMA).

30	75	79	80	80	105	126	138	149	179	179	191
223	232	232	236	240	242	245	247	254	274	384	470

Compute mode, median, first quartiles, third quartiles, range, IQR

Q.3 Attempt any one (12)

a) In a process that manufactures aluminium cans, the probability that a can has a flaw on its side is 0.02, the probability that a can has a flaw on the top is 0.03, and the probability that a can has a flaw on both the side and the top is 0.01.

i) What is the probability that a randomly chosen can has a flaw?

ii) What is the probability that it has no flaw?

(P.T.O)

b) The following data show the salary for superintendents in 20 districts.

187	184	174	185	175	172	202	197	165	208
215	164	162	172	182	156	172	175	170	183

Use classes of 150–159, 160–169, and so on in the following. Show the frequency distribution.

c) In the past year, 13% of businesses have eliminated jobs. If 5 businesses are selected at random, find the probability that at least 3 have eliminated jobs during the last year.

SECTION - II

Q.4 Attempt any one (11)

a) A quality engineer wants to inspect rolls of wallpaper to obtain information on the rate at which flaws in the printing are occurring. She decides to draw a sample of 50 rolls of wallpaper from a day's production. Each hour for 5 hours, she takes the 10 most recently produced rolls and counts the number of flaws on each. What is the sampling method used in this case?

b) In a small business firm, two typists are employed-typist A and typist B. Typist A types out, on an average, 30 pages per day with a standard deviation of 6. Typist B, on an average, types out 45 pages with a standard deviation of 10. Which typist shows greater consistency in his output?

Q.5 Attempt any one (12)

a) A certain industrial process is brought down for recalibration whenever the quality of the items produced falls below specifications. Let X represent the number of times the process is recalibrated during a week, and assume that X has the following probability mass function. Find the mean, variance and standard deviation of X

X	0	1	2	3	4
P(X)	0.35	0.25	0.20	0.15	0.05

b) Lifetimes of batteries in a certain application are normally distributed with mean 50 hours and standard deviation 5 hours. Find the probability that a randomly chosen battery lasts between 42 and 52 hours.

Q.6 Attempt any one (12)

a) The average number of calories in a 1.5-ounce chocolate is 225. Suppose that the distribution of calories is approximately normal with $\sigma = 10$. Find the probability that a chocolate will have between 200 and 220 calories

b) Perform test of independence addresses the question of whether the coffee preference (light, regular, or dark) is independent of the gender of the coffee drinker (male, female). Take $\alpha = 0.05$

		Coffee Preference			
		Light	**Regular**	**Dark**	**Total**
Gender	**Male**	20	40	20	80
	Female	30	30	10	70
	Total	50	70	30	150