Enrollment No.: _____

Darshan Institute of Engineering & Technology
B.Tech. | Sem-4 | Summer-2024

Course Code	:	2301HS402	**Date**	:	29-04-2024
Course Name	:	Probability & Statistics	**Duration**	:	150 Minutes
			Total Marks	:	70

Instructions:
1. Attempt all the questions.
2. Figures to the right indicates maximum marks.
3. Make suitable assumptions wherever necessary.

Q.1 **(A)** Write all formulas of Mean, Mode, standard deviation and Mean Deviation. **4**

(B) Calculate the median for the following data: **3**

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	5	7	2	3	3

OR

Find the mode of the following data:

Class	400 - 500	500 – 600	600 - 700	700 - 800	800 – 900
Frequency	8	16	20	17	03

(C) Obtained first four Moments and Kurtosis for the following data: **7**

Scorer	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Player	8	11	18	09	04

OR

Find the Mean deviation about the mean and median from the following data:

Size	4	6	8	10	12	14	16
Frequency	1	2	4	5	4	3	1

Q.2 **(A)** A discrete random variable has probability mass function is given below: **4**

X	−2	−1	0	1	2	3
P(X = x)	0.2	k	0.1	2k	0.1	2k

Find k, $P(X \geq 1)$, $P(-1 < X \leq 2)$, $P(X < 0)$.

(B) If A and B are two events such that $P(A) = 0.3,\ P(B) = 0.4,\ P(A \cap B) = 0.2$, then find $P(A \cup B),\ P(A \mid B'),\ P(A' \cap B')$. **3**

OR

A husbands and wife approached in interview for two vacancies in an office. The probability of husband's selection is $\frac{1}{7}$ and wife's selection is $\frac{1}{5}$. Find the probability that (i) at least one of them is selected, (ii) none of them is selected, (iii) both of them are selected.

(C) Of three persons the chances that a Politician, a businessman, an academician would be appointed the vice chancellor (VC) of university are 0.5, 0.3, 0.2 respectively. If research is promoted, then find the probability that VC is (i) Politian, (ii) businessman, (iii) academician. **7**

OR

If the PDF of random variable is given by $f(x) = \begin{cases} k(1-x^2) & ; \ 0 < X < 1 \\ 0 & ; \ \text{otherwise} \end{cases}$, then find the value of k, $P(X > 0.5), P(0.1 < X < 0.2)$.

Q.3 **(A)** 4 coins are tossed simultaneously, what is the probability of getting (i) two heads, (ii) at least two heads, (iii) at most two heads. **4**

(B) The number of accidents in year attributed to taxi driver in city with mean 3. Out of 1000 taxi drivers, find the expected number of drivers with more than 3 accidents in a year. **3**

OR

If a Poisson distribution is such that $3P(X = 1) = 2P(X = 3)$, then find mean and $P(X = 1)$.

(C) If X is normal variate with mean is 30 and SD is 5, then find **7**
(i) $P(26 < X < 45)$, (ii) $P(X > 45)$, (iii) $P(X < 26)$
$[P(0 < Z < 0.8) = 0.2881, P(0 < Z < 2) = 0.4772, P(0 < Z < 3) = 0.4987$

OR

If X is normal variate with mean 120 and SD is 10, find the value of c such that $P(X > c) = 0.02$ and $P(X < c) = 0.05$
$[\ P(0 < Z < 2.05) = 0.48, P(0 < Z < -1.64) = 0.45\ ]$.

Q.4 **(A)** 500 units from a factory are inspected and 12 are found to be defective, 800 units from another factory are inspected and 12 are found to be defective. Can it be concluded at 5% level of significance that production at second factory is better that in first factory. $(Z_{0.05} > 1.645)$ **4**

(B) Fit the line $y = a + bx$ for the following data: **3**

x	0	5	10	15	20	25
y	12	15	17	22	24	30

OR

In a hospital 480 female and 520 male babies were born in a week. Do these figures confirm the hypothesis that males and females were born in equal numbers? $(Z_{0.05} = 1.96)$

(C) Obtained the regression line on (i) y on x and (ii) x on y for the following data: **7**

x	100	98	78	85	110	93	80
Y	85	90	70	72	95	81	74

OR

Obtain the rank correlation coefficient for the following data:

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

Q.5 **(A)** Samples of sizes 10 and 14 were taken from two normal populations with standard deviation 3.5 and 5.2. The sample means were found to be 20.3 and 18.6. Test whether the means of the two populations are the same at 5% level. $(t_{(0.05,\ 22)} = 2.074)$. **4**

(B) A random sample of size 15 from a bivariate normal population gave correlation coefficient $r = 0.5$. Is this indicate the correlation in the population? Choose $\alpha = 0.05$ as level of significance. $(t_{(0.05,\ 13)} = 2.1604)$ **3**

OR

A sample of 20 items has mean 42 units and standard deviation 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units. $(t_{(0.05,\ 19)} = 2.09)$

(C) The number of defects in printed circuit board is hypothesized to follow Poisson distribution with mean $\lambda = 1$. **7**

Number of defects	0	1	2	3
Observed frequency	32	15	09	04

Use chi-square distribution to test the claim that the number defects follows the Poisson distribution. $\left(\chi^2{}_{(0.05,\ 1)} = 3.84\right)$

OR

Two nicotine contents in two random samples of tobacco are given below:

Sample-I	21	24	25	26	27	–
Sample-II	22	27	28	30	31	36

Can we say that two samples came from the same normal population?
$(F_{0.05}(5,4) = 5.19)$ $\left(t_{(0.05,\ 9)} = 2.26\right)$

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