Q. P. Code : 09456

(3 Hours) **Total Marks:70**

Note: All Questions are **compulsory.**

Use of **simple calculators** is allowed.

Figures at the right indicate **full marks**.

Q1. (a) Attempt any 7 [2 marks each]: **[14]**

(i) The Mean of 20 observations was found to be 16.5. It was later discovered that one observation was wrongly copied as 12 instead of 21. Find the correct mean.
(a)16.95 (b)17.85 (c)16.59 (d)17.58

(ii) If $\bar{x}$=200, S.D=16, SK_p=0.3, then the value of mode is;
(a) 185.2 (b) 195.2 (c) 196.3 (d)186.3

(iii) If 75% of the items lies above 40 and 75% of the items lies below 60, then co-efficient of Quartile deviation is:
(a) 0.46 (b) 0.64 (c) 0.04 (d) 0.20

(iv) If Mode=195.2, Median=198.4, then the approximate value of mean is
(a) 200 (b) 250 (c) 210 (d) 225

(v) The degree of _____ of a distribution is measured relative to the peakedness of a symmetric bell-shaped curve.
(a) Skewness (b) Moments (c) Kurtosis (d) None of these

(vi) If Median and S.D are 50 and 20 respectively. If each item is increased by 5 then the Median and S.D will be;
(a) 50,20 (b) 45,20 (c) 55,25 (d) 55,20

(vii) Two dice are thrown simultaneously. What is the probability of obtaining sum of the numbers less than 11?
(a) 17/18 (b) 1/12 (c) 11/12 (d) None of these

(viii) For a binomial distribution, mean=4 and variance= 4/3 , then the value of parameters n and p are
(a) 6 and $\frac{2}{3}$ (b) 2 and $\frac{3}{2}$ (c) 6 and $\frac{3}{2}$ (d) 3 and $\frac{4}{3}$

(ix) For a Poisson variate X, P(X=1) = P(X=2). Find P(X=4)
(a) 0.090224 (b) 0.05288 (c) 0.021100 (d) 0.07684

(b) **Attempt any 1** **[1]**

(x) In a hypothesis test the Null hypothesis is accepted if:
(a) Test value is more than critical value (b) Test value is less than critical value
(c) Test value is equal to critical value (d) none of these

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(xi) If A ia any event, then which of the following inequality is more accurate?
(a) $-1 \leq P(A) \leq 1$ (b) $0 \leq P(A) \leq 1$ (c) $-1 < P(A) < 1$ (d) $0 < P(A) < 1$

Q.2 (a) Attempt any 2[4 marks each] **[8]**

(i) The following data gives the weight distribution of students in a class. Find the average weight of the students.

Wt.(in kgs.)	41	42	43	44	45	46	47	48
No.of students	3	6	8	15	17	12	5	3

(ii) Calculate the Q.D and its co-efficient for the following data.

Wages (in Rs.)	30 – 32	32-34	34 -36	36 -38	38 -40	40 -42	42 -44
No. of Workers	12	18	16	14	12	8	6

(iii) Calculate the 6^{th} decile (D_6) and 70^{th} percentile (P_{35}) for the following data.

Marks	0 – 9.5	9.5 – 19.5	19.5 – 29.5	29.5 – 39.5	39.5 – 49.5	49.5 – 59.5	59.5 – 69.5	69.5 – 79.5
No. of students	4	2	18	22	21	19	10	3

(b) Attempt any 1 [3 marks] **[3]**

(i) Find the missing value of the variate for the following distribution whose mean is 31.87.

x	12	20	27	33	-	54
f	8	16	48	90	30	8

(ii) The mean monthly salary paid to 300 employees of a firm is Rs.14,700. The mean monthly salary of 200 male employees is Rs.15,050. Find the mean monthly salary of remaining female employees.

Q.3. (a) Attempt any 2[4 marks each] **[8]**

(i) The values of A.M and S.D of 12 observations are 22 & 3 resp. It was later discovered that one observations 32 was wrongly taken as 23. Calculate the correct values of A.M, S.D and C.V.

(ii) Calculate M.D from median and corresponding co-efficient of M.D for the following data:-
100,150,200,250,360,490,500,600,676.

(iii) Find the missing frequency for the following data given that the mode of the distribution is 44.

Age(in year)	0 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60– 70	70 – 80	80– 90
No.of persons	10	10	-	50	29	15	10	10

(b) Attempt any 1 [3 marks] **[3]**

(i) The first four moments about the origin are 1, 4, 10, 46. Comment upon the Skewness and Kurtosis of the distribution.

(ii) Discuss the Characteristics of an ideal/good measure of dispersion.

Q.4. (a) Attempt any 2[4 marks each] **[8]**

(i) Find the Karl Pearson's co-efficient of Skewness for the following data:

Class	10 - 12	12 - 14	14 - 16	16- 18	18- 20	20 -22
Frequency	5	9	15	17	10	4

(ii) Consider the following data:
Find the first, second, third & fourth central moments & hence comment on Skewness of the set of numbers: 1,4,9,12,15

(iii) A certain drug is given to two patients. Probability that the patient A will recover is 2/3 and that of Patient B will recover is 3/4. Find the probability that
(a) Both the patients will recover.
(b) Both the patients will not recover.
(c) Drug is effective.

(b) Attempt any 1 [3 marks] **[3]**

(i) Find k and hence find the expected value of a random variable x and variance for the probability distribution:-

x	2	3	4	5
P(x)	0.1	k	0.4	0.3

(ii) A fair dice is rolled. Write down the sample space of the experiment. Find the probability that the number on the uppermost face is
(a) An odd number. (b) A prime number. (c) A perfect square.

Q.5 (a) Attempt any 2 [4 marks each] **[8]**

(i) An unbiased coin is tossed five times. What is the probability of getting
1. Exactly two heads. 2. At least two heads.

(ii) Fit an exponential curve $y=ab^x$, from the following data:

Year	2010	2011	2012	2013	2014
Income(in lakhs)	6	9	14	15	18

(iii) Suppose the number of telephone calls that an operator receives during a specified time-interval of the day follows Poisson distribution with mean 3. Find the probability that during this specified time-interval next day, the operator will receive.
1. No telephone calls. 2. At the most one telephone call.

(b) Attempt any 1 [3 marks] **[3]**

(i) At a printing press, 3% of the books are found to have defective binding. Find the probability that out of 250 books bound at the printing press, exactly 4 books will have defective binding.

(ii) The height of students in Jay Bharat College follows normal distribution with mean height of 155cms. & S.D of height as 5cms. Find
1. Chance that height of a randomly chosen student from this college exceeds 158cms.
2. Percentage of students with height less than 150cms.
3. Minimum height of tallest 10% students.

Given: { Area between Z=0 and Z=0.6 is 0.2257; Area between Z=0 and Z=0.1 is 0.3413; P(Z > 1.28)=0. }

Q.6 (a) Attempt any 2 [4 marks each] **[8]**

(i) Average height of a sample of 6400 persons from one population was found to be 67.85 inches with a standard deviation of 2.56 inches. Another sample 1600 persons showed a mean of 68 inches & standard deviation of 2.52 inches. Is the difference between the mean heights significant? Test the hypothesis at 1% level of significance.

(ii) To test the efficiency of a new drug a controlled experiment was conducted where in 300 patients were given a new drug & 200 other patients were not given that drug. The patients were monitored & results obtained were as follows:-

	Cured	Condition worsened	No effect	Total
Given the drug	200	40	60	300
Not given the drug	120	30	50	200
Total	320	70	110	500

(iii) The following table gives the yields of 15 sample plots under three varieties of seed.

A	B	C
5	8	7
6	10	3
8	11	5
9	12	4
7	4	1

You are required to find if the average yields of land under different varieties of seed show significant differences. Use ANOVA technique, given that $F_{0.05}(2,12) = 3.89$.

(b) Attempt any 1 [3 marks] **[3]**

(i) Two random samples of 10 & 14 observations were drawn. The sum of squares of deviations from means for each sample were 130.5 & 148.5 resp. Test whether the difference is significant at 5% l.o.s. [$F_{0.05}=(9,13)=2.71$]

(ii) From a random sample of size n=9 is drawn from normal population gave the following observations:

72, 74, 68, 70, 61, 63, 69, 73 and 71.

To test: $H_0 : \sigma^2 = 36$ V_s $H_1 : \sigma^2 \neq 36$ (Use at 10% l.o.s.)

(Given that table value of χ^2 with 8 d.f at 5% l.o.s. is 2.306)