**SP-17**

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# S.Y. B.Tech. (Computer Science and Engineering (AIML))
## (Semester - III) (CBCS) Examination, January - 2024
## PROBABILITY AND STATISTICS
## Sub. Code : 86160

**Day and Date : Tuesday, 02 - 01 - 2024** **Total Marks : 70**

**Time : 10.30 a.m. to 1.00 p.m.**

**Instructions :**
1) **Solve any three questions from Q.1 to Q.4.**
2) **Solve any three questions from Q.5 to Q.8.**
3) **Figures to the right indicate full marks.**
4) **Use of non-programable calculator is allowed.**

**Q1)** a) Find the mode of the following data : **[6]**

| Age | 0-6 | 6-12 | 12-18 | 18-24 | 24-30 | 30-36 | 36-42 |
|---|---|---|---|---|---|---|---|
| Frequency | 6 | 11 | 25 | 35 | 18 | 12 | 6 |

b) Calculate mean deviation from median of the following data. **[6]**

| Class | 50-100 | 100-150 | 150-200 | 200-250 | 250-300 | 300-350 |
|---|---|---|---|---|---|---|
| Frequency | 7 | 18 | 25 | 31 | 15 | 4 |

**Q2)** a) For the following data calculate Karl Pearson's coefficient of correlation between x and y. **[5]**

| x | 5 | 7 | 8 | 10 | 11 | 13 | 16 |
|---|---|---|---|---|---|---|---|
| y | 33 | 30 | 28 | 20 | 18 | 16 | 9 |

b) Fit a second-degree parabolic curve to the following data. **[6]**

| x | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4 |
|---|---|---|---|---|---|---|---|
| y | 1.1 | 1.3 | 1.6 | 2.0 | 2.7 | 3.4 | 4.1 |

**Q3)** a) Find the value of $k$, if the function **[5]**

$$f(x)=\begin{cases} kx^2(1-x^3), & 0\le x\le 1 \\ 0, & otherwise \end{cases}$$

is a probability density function.

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b) From a box containing 100 transistors 20 of which are defective, 10 are selected at random. Find the probability that **[6]**

i) all will be defective

ii) all are non-defective

iii) at least one is defective

**Q4)** a) Find the two lines of regression for the following data. **[6]**

| x | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|
| y | 11 | 14 | 14 | 15 | 12 | 17 | 16 |

b) A firm has two cars which it hires day by day. The number of demands for a car on each day is distributed as a Poisson variate with mean 1.5. Calculate the probable number of days in a year on which **[6]**

i) Neither car is in demand

ii) A demand is refused

**Q5)** a) In a sample of 400 parts manufactured by a factory, the number of defective parts was found to be 30. The company, however, claimed that atmost 5% of their product is defective. Is the claim tenable? **[6]**

b) It is claimed that a random sample of 100 tyres with a mean life of 15269 kms is drawn from a population of tyres which has a mean life og 15200 kms and a standard deviation of 1248 kms. Test the validity of the claim at **[6]**

i) 5% and

ii) 1% level of significance.

***Q6)*** a) If the fuzzy sets A and B are defined by **[6]**

$$A(x) = \frac{0.1}{x_1} + \frac{0.6}{x_2} + \frac{0.8}{x_3} + \frac{0.9}{x_4} + \frac{0.7}{x_5} + \frac{0.1}{x_6},$$

$$B(x) = \frac{0.9}{x_1} + \frac{0.7}{x_2} + \frac{0.5}{x_3} + \frac{0.2}{x_4} + \frac{0.1}{x_5} + \frac{0}{x_6}$$

Find $\overline{A} \cap B, A \cup \overline{B}, A \cup \overline{A}, B \cup \overline{B}$.

b) For the fuzzy set A defined below, find the fuzzy cardinality of A.

$A(x) = 2^{-x}$, $x \in \{0, 1, 2, 3, 4, 5\}$ **[5]**

**Q7)** a) Solve the following assignment problem. **[6]**

Jobs

| Machines | A | B | C | D |
|---|---|---|---|---|
| I | 10 | 8 | 7 | 13 |
| II | 12 | 14 | 7 | 11 |
| III | 11 | 9 | 10 | 12 |
| IV | 10 | 12 | 12 | 13 |

b) Explain the Hungarian method of solving an assignment problem. **[5]**

**Q8)** a) In order to test whether a coin is perfect, it is tossed 5 times. The null hypothesis of perfectness is rejected if and only if more than 4 heads are obtained. Obtain the **[6]**

i) Critical region

ii) Probability of type I error

iii) Probability of type II error, when the corresponding probability of getting a head is 0.2.

b) If the fuzzy sets A and B are defined by **[6]**

$$A(x) = \frac{x}{x+2}, x \in \{0, 1, 2, 3, 4, 5\},$$

$$B(x) = 1 - \frac{x}{10}, x \in \{0, 1, 2, 3, 4, 5\}$$

Calculate the degree of subset hood of A in B.

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