Semester III (B.Tech)

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Er. No. 20183038

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Jaypee University of Engineering & Technology, Guna

T-3 (Odd Semester 2021)

18B11CI916 – Statistical Methods and Data Analysis

Maximum Duration: 2 Hours

Maximum Marks: 35

Notes:

1. This question paper has 6 questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).
4. Students are permitted to use statistical tables (z, t, f).

Q1. A researcher estimates that the average height of the buildings of 30 or more stories in a large city is at least 700 feet. A random sample of 10 buildings is selected, and the heights in feet are shown below. **Marks [06]**

585	611	841	725	615	720	835	635	616	582

(a) Formulate the null and alternate hypotheses and show the calculation of standard error.

(b) At $\alpha = 0.05$, is there enough evidence to reject the claim? Illustrate your answer with the help of a diagram.

Q2. A recent survey found that 68.6% of the population own their homes. In a random sample of 150 heads of households, 92 responded that they owned their homes. At the $\alpha = 0.01$ level of significance, does the sample data suggest a difference from the national proportion? Use the P-value method and illustrate your answer with the help of a diagram. **[06]**

Q3. A random sample of state petrol taxes (in rupees) is shown below for 10 states. **[06]**

38.4	40.9	67	32.5	51.5	43.4	38	43.4	50.7	35.4

Use the data to estimate a 90% confidence interval of the population mean petrol tax. What assumption must you make about the population distribution in order to construct the confidence interval estimate?

Q4 Integrated circuits are manufactured on silicon wafers through a process that involves a series of steps. An experiment was carried out to study the effect on the yield of using three methods in the cleansing step. The results are shown as follows: **[06]**

New 1	New 2	Standard
38	29	31
34	35	23
38	34	38
34	20	29
19	35	32
28	37	30

(a) Calculate SSTR, SSE and show the ANOVA table.

(b) At the 0.05 level of significance, is there evidence of a difference in the mean yield among the methods used in the cleansing steps?

Q5. The marketing manager of a large supermarket chain would like to use shelf space to predict the sales of pet food. A random sample of 8 equal-sized stores is selected, with the following results: **[06]**

shelf space	5	5	5	10	10	10	15	15
weekly sales	160	220	140	190	240	260	230	270

(a) Construct a scatter diagram for these data with **weekly sales** as independent variable.

(b) Use the least squares method to develop the estimated regression equation with **weekly sales** as independent variable.

(c) Provide an interpretation for the slope of the estimated regression equation.

(d) Predict the weekly sales of pet food for stores with 8 feet of shelf space.

Q6. Why do most of the sample means differ somewhat from the population mean? What does the central limit theorem say about the shape of the distribution of sample means? **[05]**

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$y = b_0 + b_1 x$

$b_0 = \bar{y} - b_1 \bar{x}$