APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M.TECH DEGREE EXAMINATION
Civil Engineering
(Transportation Engineering)
CE 6201 - Applied Statistics and Probability

Time: 3 hrs   Max. Marks: 60

PART A
(Answer all questions. Each question carry 3 marks).

1. Let the average mark of 40 students of a class A be 38; the average mark of 60 students of another class B is 42. Find the average mark of the combined group of 100 students. (3)

2. Define binomial distribution. Obtain its mean and variance. (3)

3. Obtain normal equations for the curve of the form $y = ae^{bx}$. (3)

4. It is desired to estimate the mean time of continuous use until an answering machine will first require service. If it can be assumed that $\sigma = 60$ days, how large a sample is needed so that one will be able to assert with 90% confidence that the sample mean is off by at most 10 days? (3)

5. The college bookstore tells prospective students that the average cost of its textbooks is Rs.52 with a standard deviation of Rs.4.50. A group of smart statistics students thinks that the average cost is higher. In order to test the bookstores claim against their alternative, the students will select a random sample of size 100. Assume that the mean from their random sample is Rs.52.80. Perform a hypothesis test at the 5% level of significance and state your decision. (3)

6. The manufacturer of a patent medicine claimed that is it was 90% effective in relieving an allergy for a period of 8 hours. In a sample of 200 people who had allergy, the medicine provided relief for 160 people. Determine whether the manufacturers claim is legitimate. (3)

7. Playing 10 rounds of golf on his home course, a golf professional averaged 71.3 with a standard deviation of 1.32. Test the null hypothesis that the consistency of his game on his home course is actually measured by $\sigma = 120$, against the alternative hypothesis that he is less consistent. Use level of significance $\alpha = 0.05$. (3)

8. Define one way classification of ANOVA. (3)

PART B
(Each full question carries 6 marks).

9. The runs scored by 2 batsman in 5 innings are given. Find the more consistent batsman. (6)

A:	25	50	45	30	70
B:	10	70	50	20	95

OR

10. Find the arithmetic mean, median and mode from the following data. (6)

Marks :	0-10	10-20	20-30	30-40	40-50	50-60
No.of students:	3	9	15	30	18	5

11. Show that $f(x) = ke^{\frac{-1}{2}(\frac{x-a}{b})^2}$ is a valid p.d.f. if $k = \frac{1}{b\sqrt{2\pi}}$. (6)

OR

12. Let X is normally distributed with mean 12 and standard deviation 4. Find x_0' and x_1' when (6)

$$P(x_0' < X < x_1') = 0.5 \quad \text{and} \quad P(X > x_1') = 0.25.$$

13. You are given the data relating to purchase and sales. Obtain two regression line equations (6) by the method of least squares and estimate the likely sales when purchase is 100.

Purchases:	62	72	98	76	81	56	76	92	88	49
Sales:	112	124	131	117	132	96	120	136	97	85

OR

14. The following are the data on the average heights of the plants and weight of yield per plot (6) recorded from 10 plots of rice crop.

Heights(cms):	28	26	32	31	37	29	36	34	39	40
Yield(kg):	75	74	82	81	90	80	88	85	92	95

Find correlation coefficient.

15. What is the size of smallest sample required to estimate an unknown proportion of customers (6) who would pay for an additional service, to within a maximum error of 0.06 with at least 95% of confidence? How would the required sample size be effected if it is known that the proportion to be estimated is at least 0.75?

OR

16. Ten bearings made by a certain process have a mean diameter of 0.5060 cm with a S.D. of (6) 0.0040 cm. Assume that the data may be looked upon as a random sample from a normal population; construct a 95% and 99% confidence interval for the actual average diameter of bearings made by this process.

17. Two random samples drawn from two normal populations are: (6)

Sample I   : 20 16 26 27 23 22 18 24 25 19
Sample II   : 27 33 42 35 32 34 38 28 41 43 30 37

Can they be regarded as drawn from two normal distributions with the same variance?

OR

18. A chemical engineer, Gerald has been asked to solve a sulfur content problem in the man- (6) ufacture of rubber tire. He determined the percentage of sulfur in tires. For 100 days the number of days, which violated the 5% per limit, is:

Violations per day	0	1	2	3	4	5	6
Number of days	33	44	10	5	5	2	1

A Poisson p.m.f was used for computation and $\lambda = 1.15$ was estimated from this sample. Use the χ^2 goodness of fit test to determine if the Poisson p.m.f was a good choice.

19. As part of the investigation of the collapse of the roof of a building, a testing laboratory (6) is given all available bolts that connected the steel structure at 3 different position on the roof. The forces required to shear each of these bolts(coded values) are as follows.

$$\begin{array}{llllllll} \textbf{Position 1}: & 90 & 82 & 79 & 98 & 83 & 91 \\ \textbf{Position 2}: & 105 & 89 & 93 & 104 & 89 & 95 & 86 \\ \textbf{Position 3}: & 83 & 89 & 80 & 94 \end{array}$$

Perform an analysis of variance to test at the 0.05 level of significance whether the differences among the sample means at the 3 positions are significant.

OR

20. Samples of peanut butter produced by two different manufacturers are tested for aflatoxin (6) content, with the following results.

$$\begin{array}{llllllll} \textbf{Brand A}: & 0.5 & 0.0 & 3.2 & 1.4 & 0.0 & 1.0 & 8.6 \\ \textbf{Brand B}: & 4.7 & 6.2 & 0.0 & 10.5 & 2.1 & 0.8 & 2.9 \end{array}$$

a. Use analysis of variance to test whether the two brands differ in aflatoxin content.

b. Test the same hypothesis using a two sample t test.