

Roll No. B120851CH

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MA 2001 MATHEMATICS III

(Common to all branches)

Statistical tables are permitted

Time: 1 hr. 15 min

Max. Marks: 25

Note: Answer all questions

1. A paint manufacturer wants to determine the average drying time of a new interior wall paint. If for 12 test areas of equal size he obtained a mean drying time of 66.3 minutes and a standard deviation of 8.4 minutes, construct a 95% confidence interval for the true mean. Assume normality. (2)
2. In comparison of two kinds of varnishes, it is found that 4 samples of ten liter cans of one brand cover on the average 546 m^2 with a standard deviation of 31 m^2 , whereas 4 samples of ten liter cans of another brand cover on the average 492 m^2 with a standard deviation of 26 m^2 . Stating necessary assumptions, test at 5% level of significance whether on the average the first kind of varnish covers a greater area than the second. (3)
3. The lifetime (in hours) of 10 batteries were recorded as follows: 140, 136, 150, 144, 148, 152, 138, 141, 143, and 151. Construct a 99% confidence interval for the true variance. (2.5)
4. Given the following random samples:
Sample I: 39, 41, 42, 42, 44, 40 and *Sample II:* 40, 42, 39, 45, 38, 39, 40.
Based upon the samples, do the population variances differ significantly at 10% level? (3)
5. A manufacturer claims that an average of 2% of the bulbs manufactured by his firm is defective. A random sample of 400 bulbs contained 13 defective items. On the basis of this sample, can we accept the manufacturer's claim at 5% level? (2.5)
6. To compare the wearing qualities of two types of automobile tyres, A and B, a tyre of type A and one of type B are randomly assigned and mounted on the rear wheels of each of five automobiles. The automobiles are then operated for a specified number of kilometers and the amount of wear is recorded for each tyre. These measurements are as follows:

Automobile	1	2	3	4	5
Tyre A	10.6	9.8	12.3	9.7	8.8
Tyre B	10.2	9.4	11.8	9.1	8.3

Do the data present sufficient evidence to indicate a significant difference in the average wear for the two tyre types? Test using $\alpha = 0.05$. (2.5)

7. While testing an octa-headed die to see whether it is biased, the following results were obtained.

Face value	1	2	3	4	5	6	7	8
frequency	7	10	11	9	12	10	14	7

Do the data present sufficient evidence that the octa-headed die is fair? Conduct goodness of fit test at 5% level of significance. (3)

8. Define the following with respect to testing a null hypothesis against an alternative hypothesis.

(a) Type I error (b) Type II error (c) Power of the test. (1.5)

9. (i). Consider the problem of testing $H_0: \mu = 880$ against $H_1: \mu \neq 880$ using $\bar{x} = 871$, $s = 22$, $n = 50$ and $\alpha = 0.05$. Find the probability of Type II error (β) when the actual mean μ is equal to 877. (3)

- (ii) In a random sample of 400 industrial accidents, it was found that 220 were due to unsafe working conditions. Construct a 95% confidence interval for the true proportion. (2)