VIT
Vellore Institute of Technology

Final Assessment Test – April 2023

Course: **BMAT202L - Probability and Statistics**

Class NBR(s): **0681 / 0717 / 0737 / 0752 / 0780 / 0793 / 1018 / 1044**

Slot: **D2+TD2**

Time: **Three Hours**

Max. Marks: **100**

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN "OFF" POSITION IS TREATED AS EXAM MALPRACTICE

General Instructions: Statistical tables are permitted

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. Find the mean and mode (by grouping method) from the following data.

Central size	15	25	35	45	55	65	75	85
Frequencies	5	9	13	21	20	15	8	3

2. Calculate the quartile deviation and coefficient of quartile deviation from the following data.

Marks	Less than 35	35-37	38-40	41-43	Above 43
No. of students	14	62	99	18	7

3. The probability of a continuous random variable X is given by

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

Find the value of k and hence calculate (i) variance of x and (ii) mean deviation about mean.

4. The joint probability density function of two random variables X and Y is given by $f(x,y) = kxye^{-(x^2+y^2)}, x > 0, y > 0$. Find the value of k and prove that X and Y are independent.

5. Ten competitors on a musical test were ranked by the three Judges A, B and C in the following order:

Rank by A	1	6	5	10	3	2	4	9	7	8
Rank by B	3	5	8	4	7	10	2	1	6	9
Rank by C	6	4	9	8	1	2	3	10	5	7

Using the rank correlation method, find which pair of Judges has the nearest approach to common liking in music.

6. For the following data, find the least square regression equation of the variable X_3 on X_1 and X_2 variables.

X_1	3	5	6	8	12	14
X_2	16	10	7	4	3	2
X_3	90	72	54	42	30	12

7. In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and the standard deviation.

8. Suppose that the life time of a certain kind of battery (in hours) is a random variable having the Weibull distribution with $\alpha = 0.1$ and $\beta = 0.5$.

Find (i) The mean life time of these batteries.

(ii) The probability that such a battery will last more than 300 hours.

(iii) The probability that such a battery will not last 100 hours.

9. A sample of the heights of 6400 English men has a mean of 170 cm and a S.D of 6.4 cm, while another sample of heights of 1600 Americans has mean of 172 cm and a S.D of 6.3 cm. Do the data indicate that Americans are the average taller than the English men at 5% level of significance?

10. The following table gives the yields on 12 sample plots under three varieties of seed. Find out if the average of land under different variances show significant difference.

A	B	C
21	20	28
23	17	22
16	15	28
20	23	32

11. The Blood pressure of 5 women before and after intake of a certain drug is given below. Test whether there is a significant change in Blood pressure at 1% level of Significance.

Before	110	120	125	132	125
After	120	118	125	136	121

12. The density function of the time to failure in years of the gizmos (for use on widgets) manufactured by a certain company is given by $f(t) = \frac{200}{(t+10)^3}, t \geq 0$

(i) Derive the reliability function and determine the reliability for the first year of operation.

(ii) Compute the MTTF.

(iii) What is the design life for a reliability 0.95?

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