W/D/TY

Reg. No:

Final Assessment Test – April 2025

VIT Vellore Institute of Technology

Course: BMAT202L - Probability and Statistics

Class NBR(s): 1194 / 1195 / 1196 / 1197 / 1198 / 1199 / 1200 / 1201

Slot: B1+TB1

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

General Instruction: Statistical Tables are permitted

Answer ALL Questions

(10 X 10 = 100 Marks)

1. If the mean of the data given below is 28, find (i) the missing frequency and (ii) the median of the series. **[10]**

Profit Per Retail Shop (in Rs.)	0-10	10-20	20-30	30-40	40-50	50-60
No. of Retails shops	12	18	27	-	17	6

2. A random variable X has the following probability distribution **[10]**

x	0	1	2	3	4	5	6	7
$P(X=x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

(i) Find the value of k.

(ii) Evaluate $P(X<6), P(X\geq 6), P(0<X<5)$.

(iii) Determine the cumulative distribution function of X.

3. If X and Y are two random variables having joint probability density function **[10]**

$$f(x,y)=\begin{cases}\frac{1}{8}(6-x-y), & 0<x<2, 2<y<4\\ 0, & otherwise\end{cases}$$

Find (i) $P(X<1, Y<3)$

(ii) $P(X+Y<3)$

(iii) $P(X<1|Y<3)$.

4. Obtain the rank correlation coefficient for the following data: **[10]**

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

5. Obtain the equations of the lines of regression for the following data. Also obtain the estimate of X for $Y=70$. **[10]**

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

6. A manufacturer of cotter pins knows that 5% of his product is defective. If he sells cotter pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the probability that a box will fail to meet the guaranteed quality? **[10]**

7. The test scores of a Mathematics class with 800 students are distributed normally with a mean of 75 and a standard deviation of 7. **[10]**

i) What percentage of the class has a test score between 68 and 82?

ii) Approximately how many students have a test score between 61 and 89?

iii) What is the probability that a student chosen at random has a test score between 54 and 75?

8. Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is significant decrease in the consumption of tea after the increase of duty. **[10]**

9.a) In a sample of 8 observations, the sum of the squares of deviations of the sample values from the sample mean was 94.5 and in another sample of 10 observations, it was found to be 101.7. Test whether the difference of variance is significant. **[10]**

OR

9.b) A set of data involving 4 tropical feed stuffs A, B, C, D tried on 20 chicks is given below. All the twenty chicks are treated alike in all respects except the feeding treatment and each feeding treatment is given to 5 chicks. Analysis the following data. **[10]**

Feed	Gain in Weight				
A	55	49	42	21	52
B	61	112	30	89	63
C	42	97	81	95	92
D	169	137	169	85	154

10.a) The time to failure in operating hours of a critical solid-state power unit has the Hazard rate function **[10]**

$\lambda(t) = 0.003\left(\frac{t}{500}\right)^{0.5}$, for $t \geq 0$.

i) What is the reliability if the power unit must operate continuously for 50 hours?

ii) Determine the design life if a reliability of 0.90 is desired.

iii) Compute the mean time to failure.

iv) Given that the unit has operated for 50 hours, what is the probability that it will survive a second 50 hours of operation?

OR

10.b) The time to repair a power generator is best described by its pdf **[10]**

$$m(t) = \frac{t^2}{333}, 1 \leq t \leq 10$$

i) Find the probability that a repair will be completed in 6 hours.

ii) What is MTTR?

iii) Find the repair rate.

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