Reg. Number	

VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Continuous Assessment Test (CAT) - II – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-2024**
Course Code & Course Title	:	**BMAT202L & Probability and Statistics**	Slot	:	**F1+TF1**
Faculty	:	**Dr. Vanchinathan P Dr. Balamurugan B J Dr. Lakshmanan S Dr. Revathi G K Dr. Durga Nagarajan Dr. Padmaja N Ms. Sakthidevi K**	Class Number	:	**CH2023240500841 CH2023240500842 CH2023240500843 CH2023240500844 CH2023240500845 CH2023240500846 CH2023240500847**
Duration	:	**90 Mins**	Max. Marks	:	**50 Marks**

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

Answer all the Questions

Q.No.	Sub Sec.	Description	Marks
1		With the following data in 6 cities, calculate the Karl-Pearson's correlation coefficient between the density of population and the death rate per 1000 population.	**10**

Cities	Area in sq. miles	Population (in thousands)	No. of deaths
A	150	30	300
B	180	90	1440
C	100	40	560
D	60	42	840
E	120	72	1224
F	80	24	312

2	A	The regression equations of profits (X) on sales (Y) of a certain firm is $3Y - 5X + 108 = 0$. The average sales of the firm were Rs. 44000/- and variance of profits is $\frac{9}{16}^{th}$ of the variance of sales. Find the average profits and the coefficient of correlation between sales and profits.	5
2	B	In a blade manufacturing factory, the probability of any blade being defective is 0.002. If blades are supplied in packets of 10, find the expected number of packets containing: a) zero defective blade, and b) exactly two defective blades, in a shipment comprising 10000 packets.	5
3	A	If the lifetime X (in hours) of a hearing aid battery has Weibull distribution with $\alpha = 0.1$ and $\beta = 0.5$. Determine the probability that such a battery a) will function for more than 300 hours b) will not last 100 hours. Also, find the average lifetime in hours.	5

3	B	Let T be the malfunction time (in years) of certain components of a system. The random variable T has exponential distribution with mean time to malfunction is 5. If there are 5 of these components distributed among different systems, determine the probability that at least 2 of them are still operational after 8 years.	5
4	A	Assume that the average life span of computers produced by a company is 2040 hours with standard deviation of 60 hours. Find the expected number of computers whose life span is a) more than 2150 hours b) less than 1950 hours c) more than 1920 hours and less than 2160 hours from a pool of 2000 computers assuming that the life span X is normally distributed.	5
4	B	A random sample of 40 appliances produced by company A have a mean lifetime of 647 hours of continuous use with a standard deviation of 27 hours, while a sample of 40 produced by another company B have mean lifetime of 638 hours with standard deviation of 31 hours. Does this provide enough evidence to support the assertion by company A that their appliances are superior to those manufactured by company B, at a significance level of 0.05?	5
5	A	The CEO of a large software organization claimed that their promotion policy of programmers is impartial with respect to which language skills they possess, whether Java or Python. From a fresh batch of 300 Python programmers recruited 8 years ago, 12 have become project managers. Whereas from 420 fresh Java programmers recruited at the same time, 22 have become project managers. Is the CEO's claim valid at 5 percent significance level?.	6
5	B	A farmer promises a commission agent to supply coconuts with mean weight 600 grams and standard deviation 40 grams. A sample of 80 coconuts were weighed and found to have mean weight of 588 grams. Check if the claim of the farmer is acceptable at 1% allowed probability for type I error.	4

**********All the best **********