



VIT

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

SLOT: D1+TD1

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST – II
WINTER SEMESTER 2022-2023

Programme Name & Branch: B. Tech.

Course Code: BMAT202L

Course Name: Probability and Statistics

Class Number(s): Common to all

Exam Duration: 90 minutes

Maximum Marks: 50

General instruction(s):

1: Answer all the questions and carry equal marks

2: Students are permitted to bring handwritten notebook and statistical tables

1. The infrared reflectance spectra properties of a viscous liquid used in the electronics industry as a lubricant were studied. The following table gives the experimental results of testing the effect of band frequency x_1 and film thickness x_2 on optical density y using infrared spectrometer.

y	0.23	0.11	0.05	0.12	0.56	0.32
x_1	74	75	73	80	90	92
x_2	11	6	3	11	6	5

Fit the multiple linear regression equation of the form $y = a + bx_1 + cx_2$ and hence estimate the optical density when $x_1 = 85$ and $x_2 = 4$.

2. A new computer virus attacks a folder consisting of 10 files. Each file gets damaged with probability 0.2 independently of the other files. What is the probability that (i) at least 3 files get damaged (ii) between 3 and 7 files get damaged? (iii) Also use Poisson distribution to approximate the probability in (ii).
3. a) A city installs 1500 electric street lamps with a functional life that is normally distributed with a mean of 150 hours and a standard deviation of 30 hours. (i). How many lamps are expected to fail in between the 70 and 100 functional hours? (ii). After how many hours would we expect 90% of the lamps to still be functional? (iii) What is the probability that a lamp will function exactly 90 hours?
b) The amount of time spouses shop for anniversary cards is modelled by an exponential distribution with an average of 8 minutes. Given that the duration exceeds 6 minutes in the shop, then what is the probability that a spouse spends at least 12 minutes?
4. Consider number of male doctors in military and civilian hospitals. There are 358 and 678 male doctors in samples of 765 and 1400 military and civilian hospitals respectively. Test the claim there is a smaller proportion of male doctors in military than in civilian at 5% level of significance.
5. There are two brands of car tyres A and B in the market. A sample of 100 tyres of brand A has an average life of 37500 km with a standard deviation of 2500 km. Another sample of 75 tyres of brand B has an average life of 39000 km with a Standard deviation 3000 km. Can we conclude that the brand B is better than brand A at 5% level of significance?