Mid Term question paper

Paper Code: BS-110 Paper: Probability & Statistics for Engineers
Class: IIOT (B1) Time: 1 hr
Date: 17/6/22 Maximum Marks: 30

Section A

Q1
(a). Suppose that X takes on one of the values 1, 2, 3, 4 or 5. If

$$P(X < 3) = 0.4 \quad \text{and} P(X > 3) = 0.5,$$

Find

- $P(X = 3)$,
- $P(X < 4)$ (5)

(b) The shelf life, in days, for bottles of a certain prescribed medicine is a random variable having the density function

$$f(x) = \begin{cases} \dfrac{20,000}{(x+100)^3}, & x > 0 \\ 0, & e.w. \end{cases}$$

Find the probability that a bottle of this medicine will have a shelf life of

- at least 200 days,
- anywhere from 80 to 120 days (5)

Section B
Attempt any two questions from this section

Q2. Each rear tire on an experimental airplane is suppose to filled to a pressure of 40 pounds per square inch (psi). Let X denote the actual air pressure for the right tyre and Y denote the actual air pressure for the left tyre, Suppose that X and Y are random variables with the joint density function

$$f(x,y) = \begin{cases} k(x^2+y^2), & 30 \le x < 50, 30 \le y < 50 \\ 0, & e.w. \end{cases}$$

- Find k.
- Find $P(30 \le X \le 50 \text{ and } 30 \le Y \le 50)$ (10)

Q3
(a) A fair die is to be rolled 20 times. Find the expected value of the number of times 5 or 6 appears. (5)
(b) Suppose that X is either 1 or 2. If E[X] =1.6, find P(x=1) (5)

Q4
(a) The return from a certain investment is a random variable X with probability distribution

$$P(X = -1) = 0.7, \quad P(X = 4) = 0.2, \quad P(X = 8) = 0.1,$$

find Var(X), the variance of the return. (5)
(b) Let $Z \sim N(0, 1)$, the standard normal variate. Find the value of the question mark

$$P(-3 < Z < -2) = P(2 < Z < ?)$$

Use a picture to show that your answer is correct. (5)