**Set-2**

**Topics: Normal distribution, Functions of Random Variables**

1. **The time required for servicing transmissions is normally distributed with *μ* = 45 minutes and *σ* = 8 minutes. The service manager plans to have work begin on the transmission of a customer’s car 10 minutes after the car is dropped off and the customer is told that the car will be ready within 1 hour from drop-off. What is the probability that the service manager cannot meet his commitment?**
2. 0.3875
3. 0.2676
4. 0.5
5. 0.6987

**Ans:-** **Option B = 0.2676 (Refer Jupiter Notebook File).**

1. **The current age (in years) of 400 clerical employees at an insurance claims processing center is normally distributed with mean *μ* = 38 and Standard deviation *σ* =6. For each statement below, please specify True/False. If false, briefly explain why.**
2. **More employees at the processing center are older than 44 than between 38 and 44.**
3. **A training program for employees under the age of 30 at the center would be expected to attract about 36 employees.**

**Ans:- A-🡪 False. (Refer Jupiter Notebook File).**

Because we can see that the probability for employees at the processing center are older than 44 is less than the probability for in between 38 and 44.

**B🡪 True. (Refer Jupiter Notebook File).**

1. **If *X1*~ *N*(μ, σ2) and *X*2 ~ *N*(μ, σ2) are *iid*normal random variables, then what is the difference between 2 *X*1 and *X*1 + *X*2? Discuss both their distributions and parameters.**

**Ans:-**

Given- X1~N(μ, σ2) And *X*2 ~ *N*(μ, σ2) Find, difference between 2 *X*1 and *X*1 + *X*2?

2X1 ~ N(2μ,22σ2)

2X1 ~ N(2μ,4σ2)…………………..(1)

X1 + X2 ~ N(μ+μ,σ2+ σ2)

X1 + X2 ~ N(2μ,2σ2)……………..(2)

2*X*1 – (*X*1 + *X*2) = ?

2 *X*1 – (*X*1 + *X*2) ~ N(2μ-2μ, 4σ2+2σ2)

2 *X*1 – (*X*1 + *X*2) ~ N(0, 6σ2)

The mean of 2X1 and X1+X2 is same but the var(σ2) of  2X1 is 2 times more than the variance of X1+X2.

1. **Let X ~ N(100, 202). Find two values, *a* and *b*, symmetric about the mean, such that the probability of the random variable taking a value between them is 0.99.**
2. 90.5, 105.9
3. 80.2, 119.8
4. 22, 78
5. 48.5, 151.5
6. 90.1, 109.9

**Ans:- Option D. (Refer Jupiter Notebook File).**

1. **Consider a company that has two different divisions. The annual profits from the two divisions are independent and have distributions Profit1 ~ N(5, 32) and Profit2 ~ N(7, 42) respectively. Both the profits are in $ Million. Answer the following questions about the total profit of the company in Rupees. Assume that $1 = Rs. 45**
2. **Specify a Rupee range (centered on the mean) such that it contains 95% probability for the annual profit of the company.**
3. **Specify the 5th percentile of profit (in Rupees) for the company**
4. **Which of the two divisions has a larger probability of making a loss in a given year?**

**Ans:-** **Refer Jupiter Notebook file**.