Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Summer 2021 @ DIU Blended Learning Center

Course Code: CSE413 (Evening), Course Title: Simulation and Modeling

Level: 3 Term: 1 Section: Eve-A

Instructor: LR Modality: Open Book Exam

Date: Monday 4 July, 2021 Time: 7:15pm - 09:45pm

2:30 Hours to support online open/case study-based assessment Marks: 25

Directions:

- **Students need to go through the CASE STUDY shown in this exam paper.**
- **Analyze and answer specific section based on your own thinking and work.**
- **Do not share as this will be treated as plagiarism by Blended Learning Center.**

1. Consider about an Inventory Management System of a Pharmacy. Drugs as well as non-grocery items are delivered to pharmacy stores when any order is placed. A pharmacist checks the inventory position of the drugs by weekly schedules, e.g., **Monday** and **Friday**. The pharmacist only makes an order in **Monday** if the drugs quantity is below 4 otherwise he orders drugs in **Friday** regularly. He never places multiple orders in a week. If the recorded quantity level (**n**) is below Maximum order level (**M**), then the pharmacist will create an order to raise the inventory level to **M (= 13)**, else nothing will be done until the next review period arrives. Here the number of days between order and delivery is called lead time. Distribution of daily demand and lead time is shown in **Table 1.a** and in **Table 1.b**. The simulation will be started from **Saturday** with the quantity level of **8 units** and an order of **5 units** scheduled to arrive in **1** day time

Table 1.a Distribution of daily demand

Daily demand	Probability	Cumulative probability	Random digit
2	0.15	0.15	1-15
3	0.20	0.35	16-35
4	0.35	0.70	36-70
5	0.30	1.0	71-100
Random digits: 25, 18, 36, 10, 17, 72, 15, 17, 28, 14, 11, 20, 45, 55, 10, 16, 37, 34, 38, 17, 29			

Table 1.b Distribution of lead time(day)

Lead time (days)	Probability	Cumulative probability	Random digit
2	0.3	0.3	1-30
3	0.2	0.5	31-50
4	0.4	0.9	51-90
5	0.1	1.0	91-100
Random digits: 12, 32, 10, 28, 11			

Now answer the following questions:

a) Construct a 3 weeks simulation table for inventory system 10

b) Find out the average ending inventory and total number of shortage day 02

2. As we all know The world is fighting a war against Corona Virus and hospitals are playing a pivotal role to win this battle. With each passing day the number of patients are increasing and these hospitals are finding it hard to ensure health facilities for every patients. In connection to this "Good Wish" hospital is trying to create a future state resource schedule for their fast track system that Best Utilized the staff while caring for a high volume of patients. The current process incurs around 250 patients per day and includes a 50 bed emergency center,7 ICU's and 5 fast track rooms for patients of less severity. Total staff count for per day is 250 people including doctors, nurse, cleaning staffs and other administrative officials. This is to be noted that very limited patients need ICU support and more are with less severity. The project goal is to Optimize the staff count with the number of increasing patients. As a system engineer you are assigned to find an optimal solution to this problem with your team. **You can either go for Analytic solution or Simulation base solutions. You have to argue which side you are aiming to go for and the logical reasons behind your decision**. While making a decision please keep in mind to consider all the parameters that needs to be taken care of. **5**

3. Sara and Nita are planning to open a Telemedicine help desk to facilitate treating the patients over phone in this Covid-19 pandemic situation. They both are doctors and can't wait to serve the people in need. However, Sara leaves alone in Dhaka so she could manage more time to dedicate in this service than Nita who needs to look after her parents also. After starting the service, they start getting calls. They are shocked to see the increasing number of people reaching for their service. It is noticed that, they are getting calls with minimum **interval** of 1 minute to maximum interval of 5 minutes with equal probability. While Sara's calls/service lasts for 3 minutes to 6 minutes max with equal probability, Nita lends her services for minimum 2 minutes to 5 minutes with different probability of occurrence. Patients are kept on hold if both are busy. The probability distribution for Nita is given below.

Table: Service Distribution of Nita

Service Time (Minutes)	*Probability*	*Cumulative Probability*	*Random-Digit Assignment*
2	0.30	0.30	01–30
3	0.28	0.58	31–58
4	0.25	0.83	59–83
5	0.17	1.00	84–00

RD for Inter-arrival time **260,980,900,306,420,734,805,680,102,555,340,799**

RD for Service time **98,25,57,95,85, last 2 digits of your student ID,20,65,55,50,40,55**

a) Table for Inter Arrival time AND Table for Service time of Sara [3]

b) Simulate the system for 7 customers [3]

c) The average waiting time for all patients [1]

d) Do they need to appoint a 3rd doctor? Give your justification [1]