

Primeasia University

a mission with a vision

Department of Computer Science and Engineering (CSE)

Final Term (Part -1) Examination, Summer Semester, 2020

Course No.: CSE 417

Full Marks: 30

Course Title: Simulation and Modeling

Time: 1 hr. 15 mins

Question 1 is **compulsory** to answer. From (2-4) answer any **Two** of them. Figures in the right-hand margin indicate full marks.

1. In a pure pursuit problem, there is a target, which moves along a predetermined path, and there is a pursuer who follows the target, redirecting itself towards the target at fixed intervals of time. A fighter aircraft following an enemy bomber is an example of pure pursuit problem. The fighter corrects its direction after a fixed interval of 1 minute. The fighter's speed S is constant at 30km/min, while the target's path is specified as a function of time as below: 10

Time (t)	0	1	2	3	4	5	6	7	8	9	10	11	12
$x_b(t)$	100	110	120	130	140	149	158	168	179	188	198	209	220
$y_b(t)$	0	3	6	10	15	20	26	32	37	34	30	27	23

Initially the fighter's position is at $(x_f, y_f) = (0, 60)$ and the bomber's position is at $(x_b, y_b) = (100, 0)$. If the distance turns within 30km or less within 10 minutes, the pursuit ends, otherwise the bomber escapes and the pursuit is abandoned. Now, find whether the fighter is able to destroy the bomber or not. If the fighter succeeds in destroying then at what distance and time?

2. A sequence of 10,000 five digits random numbers has been generated, and an analysis of 10 numbers indicate that there are 3075 numbers having five different digits, 4935 having a pair, 1135 having two pairs, 695 having three of a kind, 105 having full house, 54 having four of a kind and 01 having five of a kind. Use Poker test to determine if these random numbers are independent at 99%, 98% and 95% confidence level.

Table for Poker test

Degrees of freedom	$\alpha = 0.05$	$\alpha = 0.02$	$\alpha = 0.01$
1	3.841	5.412	6.635
2	5.991	7.824	9.210
3	7.815	9.837	11.345
4	9.448	11.668	13.277
5	11.070	13.388	15.087
6	12.592	15.033	16.812
7	14.067	16.622	18.475
8	15.507	18.168	20.090
9	16.919	19.679	21.666
10	18.307	21.161	23.209

3. Do a simulation test for 10 days of an inventory system for determining 10
- I) Service level
- II) Average stock.
- III) Average shortage

Use the following information to do the simulation:

Demand	3	4	5	6
Probability	0.3	0.25	0.3	0.15

Lead time	2	3	4
Probability	0.6	0.2	0.2

The initial stock 10 units. There are two reorder points at levels of 10 and 5 units respectively. Two reorders each of quality of 10units can be outstanding at a time.

4. A small grocery has only one checkout counter. 1 to 15 customers arrive at this checkout counter at random. Time between arrivals is normally distributed with mean of 10 minutes and standard deviation of 1.5 minutes. Random value for time between arrivals: -0.44, -1.20, 0.15, 0.81, 0.74, -0.39, 0.45, 2.44, 0.59, -0.06, 0.09, 0.56, 0.65, 3.10, -0.44

The time to fill requests is also normal with mean of 9.5 minutes and standard deviation of 1.0 minute. Random value for service time: 0.55, -0.67, 0.41, 0.51, 1.53, -0.37, -0.27, -0.15, -0.02, -1.60, -0.19, 0.14, -0.07, 0.24, -1.71

Simulate the system for first 10 requests assuming a single server and find the followings:

- I. Total time elapsed,
- II. Total customer waiting time,
- III. Total server Idle time,
- IV. Average Waiting time,
- V. Percentage Capacity Utilization