

**PAN AFRICA CHRISTIAN UNIVERSITY
BACHELORS OF INFORMATION COMMUNICATION TECHNOLOGY
END OF TERM EXAMINATION**

DEPARTMENT: COMPUTING & INFORMATION TECHNOLOGY
COURSE CODE: BSIT405
COURSE TITLE: SIMULATION AND MODELING
CAMPUS: ROYSAMBU
EXAM DATE: **FRIDAY** xxxxx/ APRIL
TIME: START HOUR –5.30 Pm-7.30 Pm

INSTRUCTIONS

- This exam carry a total of SIX Questions of [10 Marks Each]
- Section One (I) is compulsory.
- Answer any 3(Three) Questions from Section Two (II)
- Read all questions carefully before attempting.

SECTION A

(Answer ALL questions in this section)

QUESTION ONE (10 Marks)

- a) Explain why optimization via simulation is difficult. (2marks)
- b) Differentiate between Deterministic and stochastic model. 2 marks)
- c) Identify the events in a single server model (2 marks)
- d) Describe the term discrete system as used in simulation. (2 marks)
- e) Explain two properties of a good Arithmetic Number generator. (2 marks)

SECTION B

((Answer any THREE (3) questions in this section))

QUESTION TWO (10 Marks)

- a) Consider the grocery store with one checkout counter. Prepare a simulation table for eight customers and find out average waiting time of customer in queue, idle time of server and average service time. The inter arrival time (IAT) and service time (ST) are given in minutes. Assume first customer arrives at time=0.

IAT	0	1	1	6	3	7	5	2	4	1
ST(min)	4	2	5	4	1	5	4	1	4	3

- i) calculate the average waiting time for customers in the queue. (2 marks)
- ii) Calculate the idle time of the server spends not serving any customer. (2 marks)
- iii) Calculate the average service time taken by the server to serve clients. (2 marks)
- iv) Draw a simulation table for the 8 customers. (4 marks)

QUESTION THREE (10 marks)

- Describe the difference between model verification and validation. (2 marks)
- Discuss two circumstances under which simulation is the appropriate tool and two circumstances under which simulation is not the appropriate tool. (8 marks)

QUESTION FOUR (10 marks)

- A recent survey indicated that 82% of single women aged 25 old will be married in their lifetime. Using the binomial distribution; Find the probability that two or three women in a sample of twenty will never get married. Show your calculation clearly.

(10

marks)

Binomial distribution table to be used.

Binomial Probability Distribution Table

This table shows the probability of x successes in n independent trials, each with probability of success p .

n	x	p																			
		0.01	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95
2		0.9801	0.9025	0.8100	0.7225	0.6400	0.5625	0.4900	0.4225	0.3600	0.3025	0.2500	0.2025	0.1600	0.1225	0.0900	0.0625	0.0400	0.0225	0.0100	0.0025
	1	0.0198	0.0950	0.1800	0.2550	0.3200	0.3750	0.4200	0.4550	0.4800	0.4950	0.5000	0.4950	0.4800	0.4550	0.4200	0.3750	0.3200	0.2550	0.1800	0.0950
	2	0.0001	0.0025	0.0100	0.0225	0.0400	0.0625	0.0900	0.1225	0.1600	0.2025	0.2500	0.3025	0.3600	0.4225	0.4900	0.5625	0.6400	0.7225	0.8100	0.9025
3		0.9703	0.8574	0.7290	0.6141	0.5120	0.4219	0.3430	0.2746	0.2160	0.1664	0.1250	0.0911	0.0640	0.0429	0.0270	0.0156	0.0080	0.0034	0.0010	0.0001
	1	0.0294	0.1354	0.2430	0.3251	0.3840	0.4219	0.4410	0.4436	0.4320	0.4084	0.3750	0.3341	0.2880	0.2389	0.1890	0.1406	0.0960	0.0574	0.0270	0.0071
	2	0.0003	0.0071	0.0270	0.0574	0.0960	0.1406	0.1890	0.2389	0.2880	0.3341	0.3750	0.4084	0.4320	0.4436	0.4410	0.4219	0.3840	0.3251	0.2430	0.1354
	3		0.0001	0.0010	0.0034	0.0080	0.0156	0.0270	0.0429	0.0640	0.0911	0.1250	0.1664	0.2160	0.2746	0.3430	0.4219	0.5120	0.6141	0.7290	0.8574
4		0.9606	0.8145	0.6561	0.5220	0.4096	0.3164	0.2401	0.1785	0.1296	0.0915	0.0625	0.0410	0.0256	0.0150	0.0081	0.0039	0.0016	0.0005	0.0001	
	1	0.0388	0.1715	0.2916	0.3685	0.4096	0.4219	0.4116	0.3845	0.3456	0.2995	0.2500	0.2005	0.1536	0.1115	0.0756	0.0469	0.0256	0.0115	0.0036	0.0005
	2	0.0006	0.0135	0.0486	0.0975	0.1536	0.2109	0.2646	0.3105	0.3456	0.3675	0.3750	0.3675	0.3456	0.3105	0.2646	0.2109	0.1536	0.0975	0.0486	0.0135
	3		0.0005	0.0036	0.0115	0.0256	0.0469	0.0756	0.1115	0.1536	0.2005	0.2500	0.2995	0.3456	0.3845	0.4116	0.4219	0.4096	0.3685	0.2916	0.1715
	4			0.0001	0.0005	0.0016	0.0039	0.0081	0.0150	0.0256	0.0410	0.0625	0.0915	0.1296	0.1785	0.2401	0.3164	0.4096	0.5220	0.6561	0.8145

QUESTION FIVE (10 Marks)

- Explain with examples, the discrete and continuous systems. (4 marks)
- With an aid of a flow chart diagram discuss the steps involved in a simulation study.

(6
marks)

QUESTION SIX (10 Marks)

a) Explain Calibration and validation of models.
(2 marks)

b) Analyze the merits and demerits of simulation technique.
(4 marks)

c) Consider a weather system with three states: "Sunny", "Cloudy", "Rainy". The transition matrix is given as:

Code	Sunny	Cloudy	Rainy
Sunny	0.7	0.2	0.1
Cloudy	0.3	0.5	0.2
Rainy	0.1	0.4	0.5

i) If today is sunny, calculate the probability that it will be rainy tomorrow (4 marks)

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