



The Co-operative University of Kenya

SUPPLIMENTARY/SPECIAL EXAMS

EXAMINATION FOR THE BACHELOR OF BUSINESS INFORMATION TECHNOLOGY/INFORMATION TECHNOLOGY

UNIT CODE: BCIT 3163

UNIT TITLE: BUSINESS SYSTEM MODELLING

DATE:

TIME: 2hrs

INSTRUCTIONS:

- Answer question **ONE (compulsory)** and any other **TWO** questions

QUESTION ONE:

- a). Define a model. (2 Marks)
- b). Discuss Linear Programming Model: (2 Marks)
- c). Enumerate Four conditions that a problem to be solved through Linear Programming must confirm to: (4 Marks)
- d) Discuss Three applications of network models (3 Marks)
- e). Describe three characteristics of operation research (3 Marks)
- f). Discuss Two advantage and disadvantage of applying net present value (NPV) in determining investments option (4 Marks)
- g). Discuss the three Phases of Operation research (3 marks)
- h). Discuss three most important information required to solve queuing problem (3 Marks)
- i). Discuss the minimum spanning tree problem (3 Marks)
- j) Briefly by use of simple diagrams and providing examples, distinguish between discrete and continuous systems in simulation and modelling. (3 Marks)

SECTION B

QUESTION TWO:

a). Discuss the Three Components of Discrete-event simulation model **(6 Marks)**

b). For an M/M/1 queue, the mean number of customers in the system (L) is equal to the utilization divided by one minus the utilization. Using basic laws and relationships, derive the mean wait in the system (W), the mean number of customers in the queueing area (L_q), and the mean wait in the queueing area (W_q) as a function of arrival rate and service rate. For full credit, your expressions need to be simplified. **(6 Marks)**

c) The Suresh retail store stocks two types of shirts A and B, These are packed in attractive cardboard boxes. In one week the store can sell a maximum of 400 shirts of type A and a maximum of 300 shirts of type B. The storage capacity, however, is limited to a maximum of 600 of both types combined.

Type A shirt fetches a profit of Kshs. 20/- per unit and type B a profit of Kshs. 50/- per unit. The store wants to establish how many of each type of shirt they need to stock per week in order to maximize their total profit.

Formulate a mathematical model for this problem **(8 marks)**

QUESTION THREE:

a) Distinguish between model Validation and Verification. **(4 Marks)**

b) Describe any THREE components of a system in simulation and modelling. **(6 Marks)**

c) Explain in detail the various types of systems in simulation and modelling. **(4 Marks)**

d) Discuss THREE types of models used in simulation and modelling. **(6 Marks)**

QUESTION FOUR:

a). Discuss the significance of introducing the slack, surplus, and artificial variable in Linear Programming. **(4 Marks)**

b). Define degeneracy in transportation problem, discuss its consequences and how it is overcome **(4 Marks)**

c). Explain the difference between assignment problem and transportation problem **(4marks)**

d). Using Vogel Approximation Method obtain the optimum solution to the following problem to minimize total transport cost **(8marks)**

	D1	D2	D3	D4	
Q1	42	48	38	37	Supply
Q2	40	49	52	51	16
Q3	39	38	40	43	15
Demand	8	9	11	16	19

QUESTION FOUR:

a). Discuss the Kendal and Lee's notation for representing queuing models **(4 Marks)**

b). A Small Project Consist of activities from A to I. The following table indicate the precedence relationship among activities and three time estimates- optimistic, most-likely and pessimistic time for each activities in a day.

Activity	Predecessor Relationship	Optimistic time (t_o)	Most Likely time t_m	Pessimistic time t_p
A	-	2	5	8
B	A	6	9	12
C	A	6	7	8
D	B,C	1	4	7
E	A	8	8	8
F	D,E	5	14	17
G	C	3	12	21
H	F,G	3	6	9
I	H	5	8	11

- Draw the project network. Determine the expected time and variance for each activity **(4Marks)**
- Obtain the total expected duration of the project and critical path **(3Marks)**
- Determine the probability of completing the project in 50 days **(3 Marks)**

c). A patient consults a doctor to check on his ill health. The Doctor finds him to be having deficiency of two vitamins, A and D. The patient is advised to consume vitamins A and D regularly for some time so as to regain his health. The doctor prescribes tonics I and II, both of which contain vitamins A, and D in certain proportions. He is also advised to consume at least 40 units of vitamin A and 50 units of vitamin D Daily. The costs of tonics I and II and the proportions of vitamins A and D that they contain are given in the table below.

Vitamins	Tonic I	Tonic II	Daily Requirements in Units
A	2	4	40
D	3	2	50
Cost per Unit in Kshs	50	30	

Formulate the linear programming model that minimizes the cost of tonic **(6 marks)**