



MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FOURTH YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

MMA 420: OPERATION RESEARCH II

Date: 12th December, 2016

Time: 3.30, - 6.30 pm

INSTRUCTIONS:

- Answer question ONE and any other TWO questions.

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ISO 9001:2008 CERTIFIED



MMA 420 - OPERATION RESEARCH II

4TH YEAR, 1ST SEM (2016/2017)

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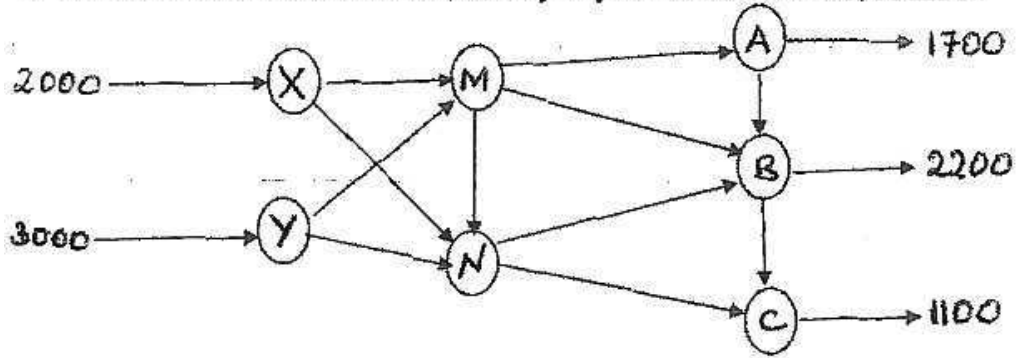
INSTRUCTION: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

Question One (Compulsory)

- a) Outline the procedure of Clark and Wright Savings Heuristic technique for solving travelling salesman problems. (4 marks)
- b) Distinguish between the following concepts. (6 marks)
- CPM and PERT
 - Network and a project
 - Linear and dynamic programming
- c) Explain the significance of service tours in vehicle scheduling. (5 marks)
- d) Trans-line bus service is studying the feasibility of introducing a mass-transfer bus system that will alleviate the traffic jam by reducing in-city driving. The study seeks the minimum number of buses that handle the transportation needs. The required number of buses could be approximated by constant values over successive 4-hour interval and each bus can operate 8 successive hours a day only. Formulate the model to be used for transport planning of the bus mode. (10 marks)
- e) A fruit vendor must pack items: food, first aid kits, and clothes. The backpack has a capacity of 3m^3 . Each unit of food takes 1m^3 . A first aid kit occupies 0.25m^3 and each piece of cloth takes about 0.5m^3 . The hiker assigns the priority weights 3, 4 and 5 to food, first aid and clothes, which means that clothes are the most valuable of the three items. From experience, the hiker must take at least one unit of each item and no more than two first-aid kits. How many of each item should the hiker take? (5 marks)

Question Two

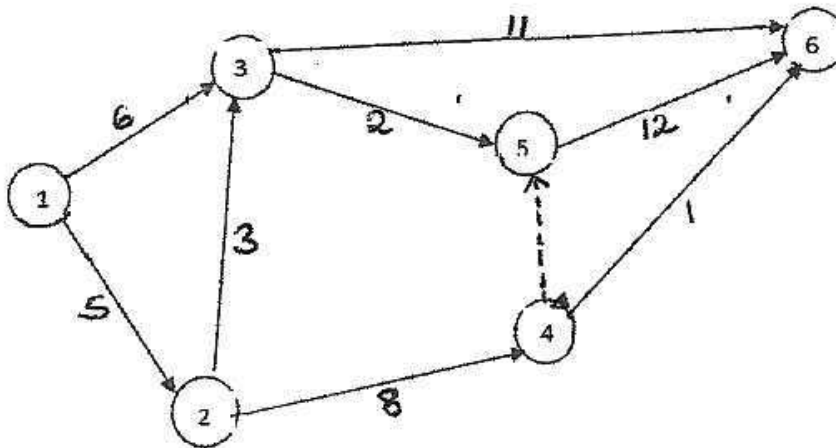
Consider the connecting links (arcs) of a transshipment model network for two car plants X and Y which are linked to the dealers A, B, C by way of two transit centers M and N.



- i. State the transshipment node(s), pure supply node(s) and the pure demand node(s). (3 marks)
- ii. Draw the required transshipment model (5 marks)
- iii. Determine the solution for the transshipment model (12 marks)

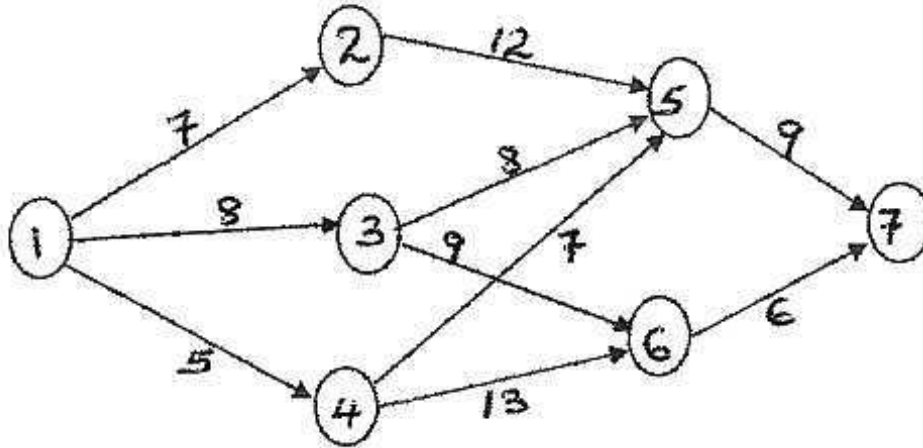
Question Three

- a) Kamau would like 6 liters of home brew today and an additional 8 liters of home brew tomorrow. Thuge is willing to sell a maximum of 6 liters total at a price of ksh40.00 per liter today and ksh20.50 per liter tomorrow. Njoroge is willing to sell a maximum of 9 liters total at a price of ksh22.50 per liter today and ksh25.60 per liter tomorrow. Kamau wishes to know what his purchases should be to minimize his cost while satisfying his thirst requirements. Formulate this problem as a transportation problem by constructing the appropriate parameter table. (8 marks)
- b) Determine the critical path for the project network shown below by applying the backward pass if the project is to be completed in 25 days. (12 marks)



Question Four

- a) Using the PERT approach, the three estimate for one of the activities are as follows: optimistic estimate are 20 hours days, most likely estimate are 40 hours and pessimistic estimate 60 hours. Determine the estimates of the mean and variance of the duration of the activity. (5 marks)
- b) Develop the backward recursive equation for the following dynamic program and use the equation to find the optimum solution. (15 marks)



Question Five

- a) Explain the meaning of the following terms optimization in network.
 - i) Maximal flow.
 - ii) Transshipment.
 - iii) Optimistic and deterministic durations
 - iv) Cut capacity(4 marks)
- b) Using the network shown in question 3(b), describe the maximum flow algorithm that can be used to determine its maximal flow (assume a unidirectional flow network) (16 marks)

THE END