MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

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

MAIN CAMPUS

MMA 420: OPERATION RESEARCH II

Date: 13th February, 2018

Time: 3.30 - 6.30 pm

INSTRUCTIONS:

- Answer question ONE and any other TWO questions

MMA 420 - OPERATION RESEARCH II

INSTRUCTION: ANSWER QUESTION **ONE** AND ANY OTHER **TWO** QUESTIONS.

Question One (Compulsory)

a) Differentiate between Linear and Dynamic programming. (2 Marks)

b) Explain **THREE** important conditions that must be satisfied by an activity (i,j) of a network for it to be considered critical. (3 marks)

c) Using the PERT three-estimate approach, the three estimates for one of the activities are as follows: optimistic estimate is 12 days, most likely estimate is 20 days and pessimistic estimate is 30 days. Determine the resulting estimates of the mean and variance of the duration of the activity. (4 marks)

d) Explain the following concepts as used in Operation Research.
   i. Critical Path Method
   ii. Maximal Flow
   iii. Network (5 marks)

e) State and explain significance of service tours in vehicle scheduling. (5 marks)

f) Guardian 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. (7 marks)

g) Outline the procedure of Clerk and Wright Heuristic technique for solving travelling salesman problems (4 marks)

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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.
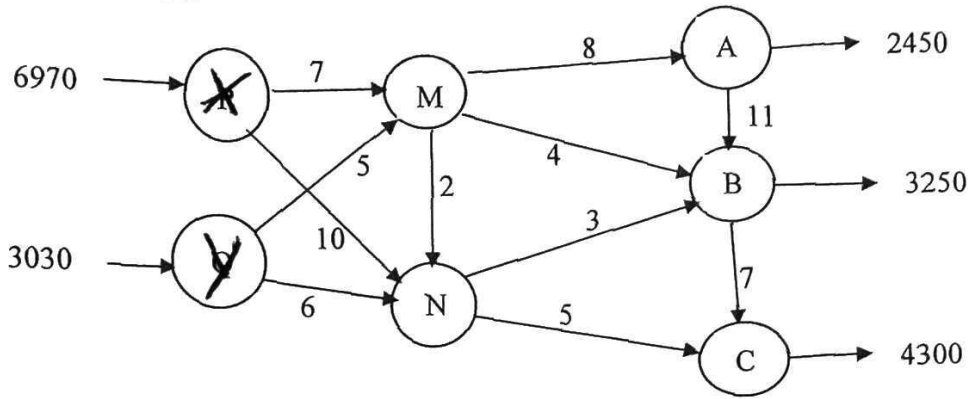
i. State the transshipment node(s), pure supply node(s) and the pure demand node(s).   (3 marks)

ii. Draw the required transshipment model   (5 marks)

iii. Determine the solution for the transshipment model   (12 marks)

Question Three

a) Chemukati would like 11 liters of home brew today and an additional 9 liters of home brew tomorrow. Tiloba is willing to sell a maximum of 8 liters total at a price of ksh 60.00 per liter today and ksh 65.00 per liter tomorrow. Sava is willing to sell a maximum of 10 liters total at a price of ksh 75.00 per liter today and ksh 55.00 per liter tomorrow. Tiloba 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 19 days.   (12 marks)
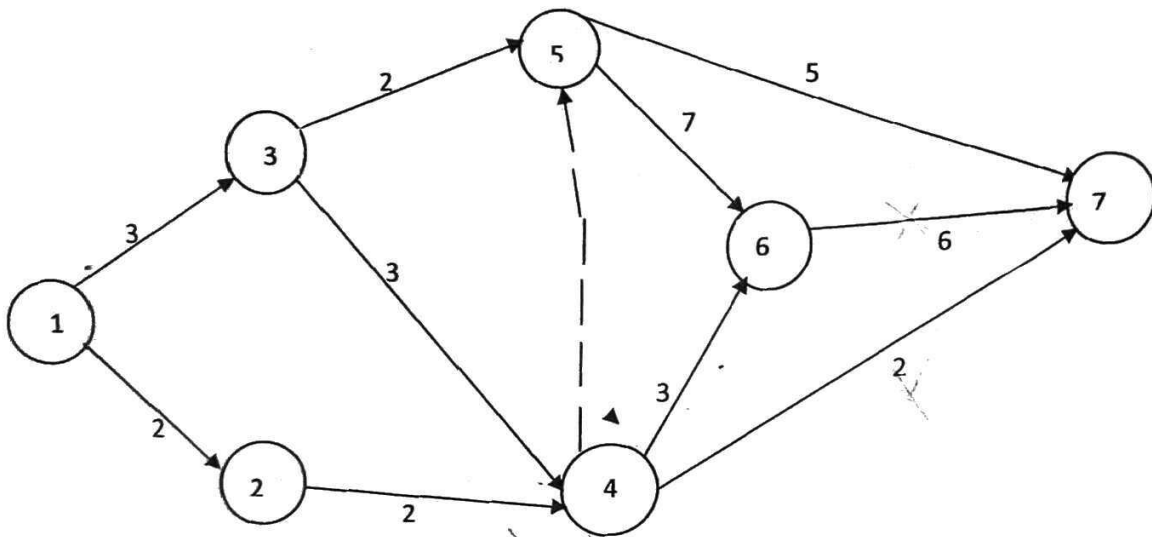
Question Four

a) Explain the meaning of the following terms optimization in network.
    i) A project.
    ii) Transshipment.
    iii) Optimistic durations
   iv) Cut capacity   (6 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)   (14 marks)

Question Five

a) Explain the reasons why Non- Critical activities of a project should be
    started as early as possible during the execution of the project.   (7 marks)

b) Consider the Dynamic Program (DP) shown below.

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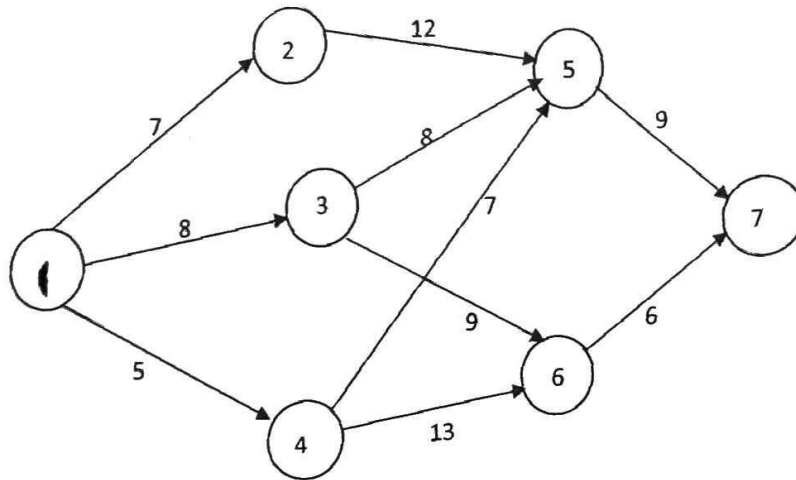
Develop a **backward recursive equation** for the DP and **use the equation** to find the optimum solution. (13 marks)

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