UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	OPERATIONAL RESEARCH
COURSE CODE	:	BPC 30803
PROGRAMME CODE	:	BPB / BPP
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 (a) Malaysian Airlines (MAAS) is considering implementing a new policy on assigning route for the pilot. Each pilot regardless of seniority, would rate in numerical order of his or her five most preferred cities as well as standby and vacation preferences. MAAS would then create a schedule that maximizes overall pilot satisfaction, giving the lowest total overall preference value. **Table Q1** shows pilot's preferred route.

Table Q1 : Pilot's preferred route

	London	Paris	Moscow	Hawaii	Tokyo	Standby	Vacation
Captain Ayra	1	2	5	3	4	6	7
Captain Aariz	2	1	7	3	6	4	5
Captain Zara	7	2	6	3	4	5	1
Captain Zarif	2	1	6	4	7	5	3
Captain Sara	1	3	7	2	4	6	5
Captain Fahim	2	3	7	1	6	5	4
Captain Yulia	5	4	7	3	2	6	1

Prepare schedule that should be assigned to the pilots.

(13 marks)

(b) Fijitsuu Sdn. Bhd., a manufacturer of motherboards for personal computer, is opening a new manufacturing plant. Once the boards have been manufactured at various areas in the plant, they will be transported to a packaging area, using an overhead conveyor belt system. From the switching station, the product will be rerouted along the main conveyor belt to the packaging area. Given the location of air conditioning, ventilation and lighting systems in the plant (assigned by number), there are many possible configurations for the design the conveyor belt system from the switching station to packaging area as shown in **Figure Q1**. The distances (in feet) are given on the arcs.
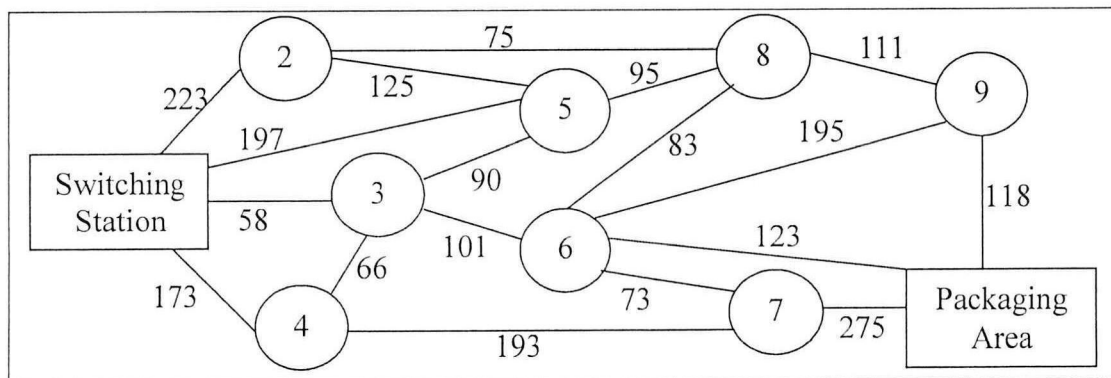

Figure Q1: Manufacturing plant layout

(i) Analyze the network to find a minimum route from switching station to packaging area.

(10 marks)

(ii) Determine the total length of minimum route.

(1 mark)

2

Q2 Three refineries send a gasoline product to two distribution terminals through a pipeline network. Any demand that cannot be satisfied through the network is required from other sources. The pipeline network is served by three pumping stations as shown in **Figure Q2**. The product flows in the network in the direction shown by the arrows. The capacity of each pipe segment, shown directly on the arcs is in million gallons per day.
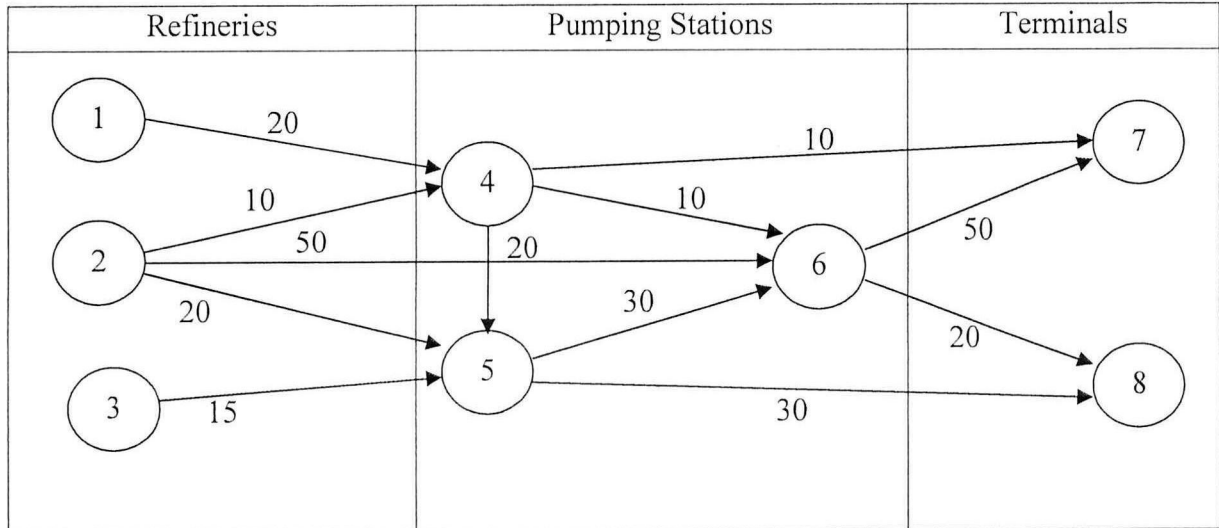

Figure Q2: Gasoline pipeline network

(a) Analyze the daily production at each refinery that matches the maximum capacity of the network.

(27 marks)

(b) State daily production for each refinery.

(3 marks)

Q3 The MRTT specializes in coal handling. MRTT has train in three locations (1, 2 and 3) and is currently working on another four locations (A, B, C and D). Requirement for existing locations 1, 2 and 3 are 35, 60 and 25 tons respectively. Location A has a capacity 30 tons, location B = 45 tons, locations C = 25 tons and location D = 20 tons. The cost per location as the following, from 1 to location A = RM50, B = RM30, C = RM60 and D = RM70. Meanwhile, distance from 2 to location A = RM20, B = RM80, C = RM10 and D = RM90. Location 3 to location A = RM100, B = RM40, C = RM80 and D = RM30.

(a) Construct the table with appropriate costs and requirements.

(6 marks)

(b) Calculate the initial feasible solution, using the following :-

(i) Corner West Method.

(8 marks)

(ii) Vogel's Approximation Method (VAM)

(14 marks)

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(c)   Compare the result in **Q3(b)(i)** and **Q3(b)(ii)** based on optimization.

(2 marks)

Q4   (a)   Analyze the network in **Figure Q4** using Floyd's Warshall Algorithm. The distances (in KM) are given on the arcs. Arc (3,5) is directional, so that no traffic is allowed from node 5 to node 3. Meanwhile, all the other arcs allow two-way traffic.
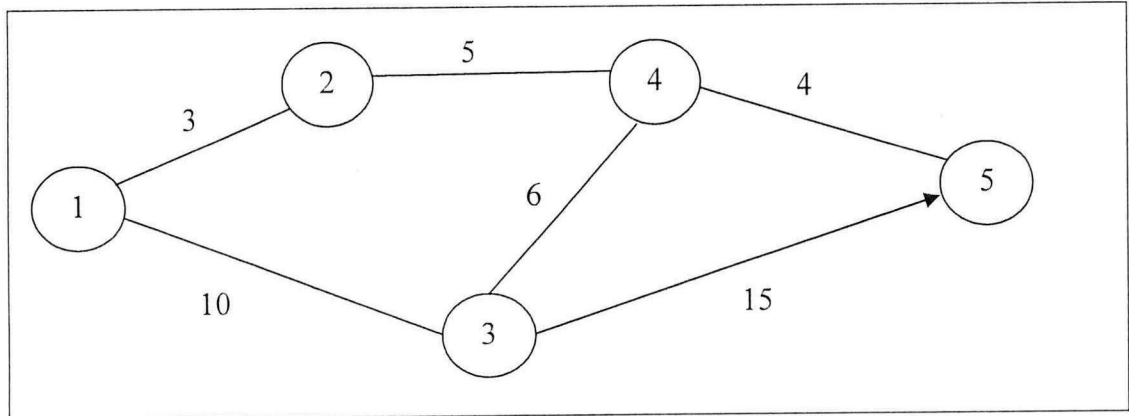

Figure Q4 : A network

(14 marks)

(b)   Determine Node 1 to Node 5:

(i)   The distance
(ii)   The path

(2 marks)

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