Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	MANAGEMENT SCIENCE I
COURSE CODE	:	BPB 20403
PROGRAMME CODE	:	BPA
EXAMINATION DATE	:	JUNE / JULY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) The Department of Business Management at UTHM is planning to begin an online MBA program. The initial start-up cost for computing equipment, facilities, course development, and staff recruitment and development is RM350,000. The department plans to charge tuition fee of RM18,000 per student per year. However, the university administration will charge the college RM12,000 per student for administrative costs.

(i) Calculate the number of students the department need to enroll to break even.

(3 marks)

(ii) Compute the profit or loss, if the department enroll 75 students.

(3 marks)

(iii) Determine whether the department should begin online MBA program if it consider in increasing the tuition fee to RM24,000 and reducing student enrollment to 35.

(4 marks)

(b) Sketch a break-even chart showing the profit and loss around the break-even point.

(10 marks)

Q2 (a) Karaikudi Restaurant has an ice cream counter where it sells two main products, ice cream and frozen yoghurt. The restaurant has enough freezer space for 115 litres total of both products. A litre of frozen yoghurt costs RM0.75 while a litre of ice cream costs RM0.93. The restaurant budgets RM90 per week for both products. The manager estimates that each week the restaurant sells twice as much ice cream as frozen yoghurt. Profit per litre of ice cream is RM4.15 while profit per liter for yoghurt is RM3.60.

Formulate a linear programming model to maximise the profit for this problem.

(5 marks)

(b) Consider the following linear programming model:

Minimise, $Z = 40A + 50B$

Subject to

$$2A + 3B \geq 30$$
$$A + B \geq 12$$
$$2A + B \geq 20$$
$$A, B \geq 0$$

(i) Determine the shadow price for binding constraints.

(6 marks)

(ii) Determine the range of optimality for each decision variable coefficient.

(9 marks)

Q3 (a) Digital Unlimited Sdn Bhd sells microcomputers to universities and colleges on the East Coast and ships them from three distribution plants. The plants' capacities are shown in **Table Q3(a)(i)**.

Table Q3(a)(i): Plants' Capacities

Plant	Capacity
P_1: Selangor	470
P_2: Penang	640
P_3: Johor	390

Four universities have ordered microcomputers that must be delivered and installed by the beginning of the academic year. The universities' demand are shown in **Table Q3(a)(ii)**.

Table Q3(a)(ii): Universities' Demand

University	Demand
U_1: Tech	520
U_2: A & M	200
U_3: State	400
U_4: Central	380

The shipping and installation costs per microcomputer (in RM) from each plant to each university are shown in **Table Q3(a)(iii)**.

Table Q3(a)(iii): Shipping and Installation Costs

From	To			
	U_1	U_2	U_3	U_4
P_1	22	17	30	18
P_2	15	35	20	25
P_3	28	21	16	14

(i) Illustrate a network representation of this problem.

(5 marks)

(ii) Formulate a linear programming model of the problem.

(6 marks)

(b) The Petroco gasoline distributor in Jackson, supplies service stations in nine other southeastern cities. The location and the distance, in kilometres, to the service stations are given in the network shown in **Figure Q3(b)**.

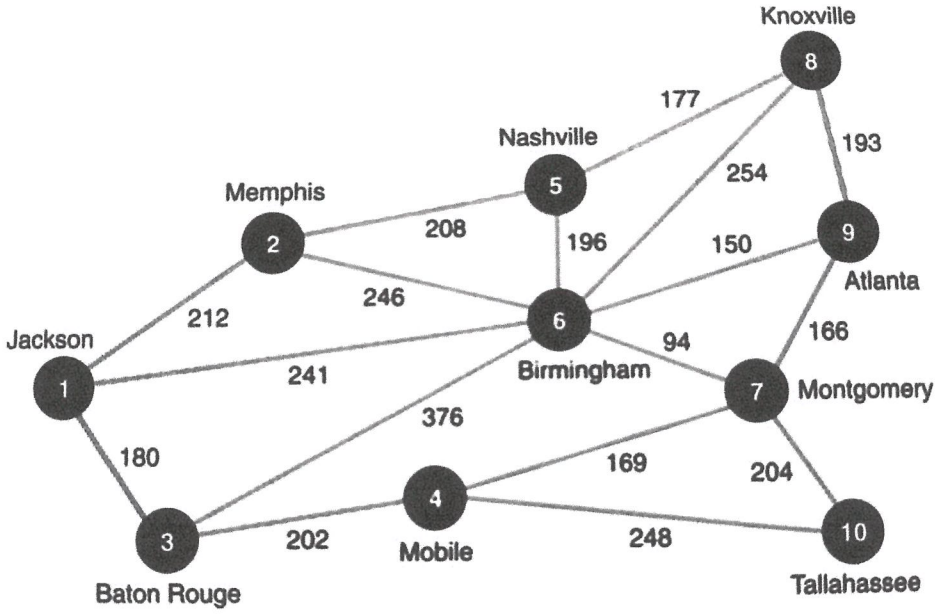

Figure Q3(b): The proximity of distributor in to its service stations

Propose the shortest route from Jackson to the nine other cities in the network.

(9 marks)

Q4 A glassblower makes glass decanters and glass trays on a weekly basis. Each item requires 1 kilogram (kg) of glass, and the glassblower has 15 kg of glass available each week. A glass decanter requires 4 hours of labor, a glass tray requires only 1 hour of labor, and the glassblower works 25 hours a week. The profit from a decanter is RM50, and the profit from a tray is RM10. The glassblower wants to determine the total number of decanters and trays that he needs to produce in order to maximize his profit.

(a) Formulate an integer linear programming model.

(5 marks)

(b) Illustrate the constraints for this problem with a standard scale in sketching. Use dots to indicate all feasible integer solutions.

(7 marks)

(c) Determine the optimal solution to the LP Relaxation, and round down to find a feasible integer solution.

(4 marks)

(d) Identify the optimal integer solution for this problem.

(2 marks)

(e) Compare the solution obtained in **Q4(c)** by rounding down with **Q4(d)**.

(2 marks)

Q5 Ashworth Industries would like to make a price and production decision on two of its products. Define Q_A and Q_B as the quantities of products A and B to produce and P_A and P_B as the price for products A and B. The weekly quantities of A and B that are sold are functions of the prices, according to the following expressions:

$$Q_A = 5500 - 200P_A + 50P_B$$
$$Q_B = 4500 - 225P_B + 100P_A$$

The fixed cost and the variable cost for product A are RM2,000 and RM18 per unit. The fixed cost and the variable cost for product B are RM1,000 and RM12 per unit.

(a) Ashworth Industries normally priced the products at RM25 and RM20 for product A and B, respectively.

Identify the number of products will be sold and gross profit with this pricing policy.

(6 marks)

(b) Formulate an expression for gross profit as a function of the selling prices for the two products.

(4 marks)

(c) (i) Calculate the optimal prices for Ashworth Industries to charge.

(6 marks)

(ii) Determine units of each products will be sold and the gross profit based on answer in **Q5c(i)**.

(4 marks)

-END OF QUESTIONS-