UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME	:	ENGINEERING ECONOMY
COURSE CODE	:	BPK30902
PROGRAMME	:	2BND/3BND/3BNE/3BNF/3BNG/ 3BNM/4BDD/4BDC/4BDM
EXAMINATION DATE	:	DECEMBER 2015/JANUARY 2016
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Company A is a manufacturing company that runs a number of machine tools each with a maximum production capacity of 150 items per day. The management of the company claims that the economic breakdown breakeven point with these machines is 70 items per day. The company's yearly expenses are shown in Table Q1 (a):

Table Q1 (a)

Descriptions:	Ringgit Malaysia (RM)
Office rental	42,000
Labour's wages	43,200
Clerk's salary	10,800
Acrylic sheets	225,000
600 bags of cement	6,720
Insurance and taxes	7,250
Maintenance of two machines	9,000
180kg of polyester resin	5,400

(i) Draw a conceptual graph to show the total revenue and total costs that this company is experiencing.

(2 marks)

(ii) Identify **FOUR (4)** types of fixed costs that the company should carefully examine to lower its breakeven point.

(4 marks)

(iii) Identify **FOUR (4)** types of variable costs that could possibly be reduced to lower the breakeven point.

(4 marks)

(b) You are appointed as a contractor for a Railway project. One of your tasks is to set up the asphalt-mixing plant equipment which has a choice of two sites. You estimate that it will cost RM5.40 per cubic yard mile (yd^3-mile) to haul the asphalt-paving material from the mixing plant to the job location. Refer to Table Q1 (b) for the factors relating to the two sites.

Table Q1 (b)

Cost factor	Site A	Site B
Average hauling distance	4 miles	3.3 miles
Monthly rental of site	RM10,000	RM9,000
Cost to set up and remove equipment	RM89,000	RM75,000
Hauling expenses	RM5.40/yd^3-mile	RM5.40/yd^3-mile
Flag person	RM90/day	Not required

The job requires 50,000m^3 of mixed-asphalt-paving material. You are given by your client to complete the works in five months (20 weeks of 6 working days per week). The delivered paving materis is paid for RM29 per m^3.

(i) Compute all fixed costs and variable cost for the two sites.

(10 marks)

(ii) Choose the best site.

(2 marks)

(iii) Calculate how much cubic yard you have to deliver before you start making a profit if total revenue (TR) is equal to total cost (TC) for the best site you already choose in (ii).

(3 marks)

Q2 (a) Table Q2 (a) below shows the past price of Commodities Oil prices since 2012, whereby 2013 is the reference year having 1064 as an index value. The weight place on Palm Oil is one (1) time, Soybean Oil is one and half (1.5) times and Coconut Oil is two (2) time.

Table Q2 (a)

Commodities Oil	Price (RM/mt) in Year		
	2012	2013	2014
Palm Oil	3,007	2,662	2,366
Soybean Oil	4,273	3,381	2,395
Coconut Oil	3,552	3,009	4,095

(i) Calculate a weighted index for the price of Commodities Oil per mt in 2014.

(4 marks)

(ii) Calculate the corresponding 2015 prices of Commodities Oil from 2014 if 946 is the index value in 2015.

(6 marks)

(b) Precast Manufacturing Sdn. Bhd. launches a new precise concrete product. The information on their product is shown in Table Q2(b). Their competitor, Berjaya MajuSdn. Bhd. offers a similar product at RM2,500 per unit. An 87% learning curve applies to the labour required and it takes 12 hours to complete the first unit. For estimation purposes, Precast Manufacturing Sdn. Bhd. decides to use time for completing the 15th unit as a standard. The profit margin is based on total manufacturing costs.

Table Q2(b)

Directory labour cost	RM65.00/hour
Factory overhead	115% of direct labour
Production materials	RM1115/unit

(i) Determine the time required to finish the 15th unit.

(3 marks)

(ii) Calculate the total cost of production.

(5 marks)

(iii) Determine the maximum profit margin.

(2 marks)

(iv) Compute the number of units that must be sold to achieve a profit of RM45,000 if the selling price of product is RM2,750.

(5 marks)

Q3 (a) You are given an alternative to purchase or lease a machinery costing RM300,000 for five (5) years in two schemes, firstly purchase with 2%per annum using yearly compounded interest per annum and secondly by leasing with a RM5,600 monthly payment.
Suggest the better alternative.

(5 marks)

(b) If you place the RM250,000 in a fixed deposit account with 5% simple interest per annum and added RM50,000 beginning of the third year which received semi-compounded interest of 4.5% yearly,
Calculate the total returns of your savings after five (5) years.

(5 marks)

(c) A new piece of equipment has been proposed by Razlan Consultant to upgrade the water quality at XYZ campsite. The investment cost is RM35,000 with salvage value of RM3,000 after 4 years. The revenue generated from the installation of the equipment minus the operating and maintenance cost of the equipment is RM6,500 per year. The MARR is 15% per year.

(i) Draw the cash flow diagram.

(5 marks)

(ii) Determine whether the equipment deserve to be installed by using the Future Worth (FW) method.

(10 marks)

Q4 (a) JAMA Corporation *(Japan-Malaysian Company)* is considering a new project to construct new railwaysand managing the High Speed Rail (HSR) trainsfrom Kuala Lumpur station to Johor Bahru. The land acquisition is estimated to be RM62 million. Construction cost for the railways and other facilities including the high-speed trainsis expected to be RM208 million with an additional annual maintenance cost of RM22 million. Finally, the projected increase in public transport travelers will require an additional railways traffic controller costing RM20 millions with an annual cost of RM8 million. Annual benefits of the railways have been estimated as in Table Q4 (a).

Table Q4 (a)

Descriptions	RM (million)
Tickets collected	36
Rental of shop lots receipts from entrepreneurs	16
Parking lots charges to visitors	14
Convenience benefit to the local community	16
Additional tourism income to the state of Johor	12

Apply the B-C ratio method for both conventional and modified cases using PW and AW methods with the study period of 20 years and a MARR of 12% per year to determine whether the JAMA Corporation should proceed with the HSR project.

(10 marks)

(b) Three mutually exclusive alternatives public-works projects are currently under consideration. Each of the projects has a useful life of 30 years and MARR of 15% per year. Their respective costs and benefits are included in Table Q4 (b).

Table Q4 (b)

Particulars	Project A	Project B	Project C
Capital Investment	10,300,000	12,500,000	15,700,000
Annual Operating & Maintenance Costs	1,300,000	1,200,000	1,000,000
Market Value	1,250,000	1,520,000	1,950,000
Annual Benefits	2,250,000	2,600,000	2,850,000

(i) Using present worth method, analyse B-C ratio for each alternative.

(10 marks)

(ii) Select project (mutually exclusive projects) should be considered according to the evaluation by B-C ratio.

(5 marks)

-END OF QUESTIONS-

Appendix

LIST OF FORMULA
$I_n = [W1 (C_{n1}/C_{k2}) + W2 (C_{n2}/C_{k2}) + W3 (C_{n3}/C_{k3})/W1 + W2 + W3] \times I_k$
$C_n = C_k (I_n/I_k)$
$Z_u = K(u^n)$
$n = \log s / \log 2$
$F/P = (1+i)^n$
$P/F = (1+i)^{-n}$
$F/A = [(1+i)^n - 1] /i$
$P/A = [1-(1+i)^{-n}] /i$
$A/F = i/ [(1+i)^n-1]$
$A/P = i/[1-(1+i)^{-n}]$
$FV_n = PV (1 + [n \times r])$
Conventional B-C ratio with PW B-C = PW(B) ÷ [(I – PW(MV)) + PW(O&M)]
Modified B-C ratio with PW B-C = [PW(B) – PW(O&M)] ÷ [I – PW(MV)]
Conventional B-C ratio with AW B-C = AW(B) ÷ [CR + AW(O&M)]
Modified B-C ratio with AW B-C = [AW(B) – AW(O&M)] ÷ CR

LIST OF DISCRETE COMPOUNDING

(F/P, 12%, 20)	:	9.6463
(P/F, 12%, 20)	:	0.1037
(F/A, 12%, 20)	:	72.0524
(P/A, 12%, 20)	:	7.4694
(A/F, 12%, 20)	:	0.0139
(A/P, 12%, 20)	:	0.1339
(F/P, 15%, 4)	:	1.7490
P/F, 15%, 4)	:	0.5718
F/A, 15%, 4)	:	4.9934
. (P/A, 15%, 4)	:	2.8550
. (A/F, 15%, 4)	:	0.2003
. (A/P, 15%, 4)	:	0.3503
. (F/P, 15%, 30)	:	66.2118
. (P/F, 15%, 30)	:	0.0151
. (F/A, 15%, 30)	:	434.7451
. (P/A, 10%, 30)	:	6.5660
. (A/F, 10%, 30)	:	0.0023
. (A/P, 10%, 30)	:	0.1523