Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	ENGINEERING ECONOMY
COURSE CODE	:	BPK 30902
PROGRAMME CODE	:	BFF / BDD / BNB / BND / BNE / BNF
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 (a) The principlesof Engineering Economy can be divided into (7) seven parts which provides a complete implementation of the regulations.

List **SEVEN (7)**principles of Engineering Economy.

(7 marks)

(b) Define the following cost items:

(i) Cash Cost

(1.5 marks)

(ii) Book Cost

(1.5 marks)

(ii) Sunk Cost

(1.5 marks)

(iii) Opportunity Cost

(1.5 marks)

(c) A motorcycle component manufacturer produces parts for bike wheels. Two processes are possible for manufacturing. Process 1 requires daily production time of 4 hours per day and production rate of 35 parts per hour. While, Process 2 requires daily production time of 7 hours per day and production rate of 15 parts per hour. Process 1 and Process 2 produced rejected parts of 20% and 9%, respectively. Both processes are fully automated, and variable overhead cost is charged at the rate of RM40 per hour. Each part is made from RM4 worth of material and good parts can be sold for RM30.

(i) Identify which process should be adopted if all good parts can be sold and rejected parts cannot be sold.

(6 marks)

(ii) Calculate the total cost if the manufacturer intended to produce 9800 units based on the process adopted in **Q1(c)(i)**.

(6 marks)

Q2 Johor Bina is preparing a cost estimation for tendering a project in Johor Bahru. They decide to rent a hydraulic excavator and hire an excavator operator for digging a deep foundation. From the information given by the Construction Industry Development Board (CIDB) the rental price for hydraulic excavator (model PC20MRX-1) with 2190kg operating weight is RM316.00 per day in 2015. The appropriate cost capacity factor for this type of machinery is 0.8. They also need to hire an excavator operator to operate the hydraulic excavator. The time for the excavator to dig $1m^3$ of soil is 1 minute. The information on the common Labor Wage Rate (LWR) is shown in **Table Q2** below.

Table Q2:Common Labor Wage Rate (LWR)

List of Labour	LWR per day (RM)	Learning Rate
Excavator Operator, Skilled, Local	84.30	0.70
Excavator Operator, Semi-skilled, Foreign	64.30	0.95

Determine:

(a) The daily rental price for similar hydraulic excavator that has 75% more operating weight capacity.

(4 marks)

(b) The time it will take for each excavator operator to dig 10^{th} m^3 of soil.

(8 marks)

(c) The total time required for each excavator to dig the first $10m^3$ of soil.

(6marks)

(d) The labor cost for each excavator operator to dig $50,000m^3$ of soil.
(Assume that the working hours for each operator is 8 hours per day and the firm take thetime to dig 10^{th} m^3 of soil as the standard time for estimating labor cost.)

(6 marks)

(e) The best operator to hire.

(1 mark)

Q3 A companyis considering to embark into a new 10 years project. The initial cost of running this new project is RM 200,000. The annual operation and maintenance cost is RM 20,000. Other monthly expenses is RM 2,500 and a salvage value of RM 10,000. The total revenue of the first year is RM 100,000 and is expected to remain the same each year through year 10. Consider MARR of 10% per year.

(a) Draw a cash flow diagram of the above project.

(5 marks)

(b) Determine the future worth (FW) of the total revenue for a 10 years period.

(5 marks)

(c) Evaluate the investment based on present worth (PW) method and briefly discussed the result.

(15 marks)

Q4 The state government of Johor is planning to build a new dam for hydroelectric supply. Instead of generating power, the dam also will be equipped with tourism facility and flood control. The government identified three suitable locations X, Y and Z. The estimated benefits and costs that are expected to be derived from the three locations under consideration are shown in Table Q2. The interest rate is 6% and the life span of each project is 40 years.

Table Q2: Estimated benefits and costs

Cost and benefit (RM Million)	**Project**		
	X	**Y**	**Z**
Initial cost	150	175	215
Power sales per year	1.9	1.5	2.1
Flood control saving per year	2.3	3.5	5.5
Irrigation benefits per year	8.1	5.5	7.0
Recreation benefits per year	5.2	1.5	3.5
Environmental impact per year	5.2	2.0	3.5
Operation and maintenance costs per year	1.5	2	2.2

(a) Calculate the cost for each project using present worth (PW) method.

(6 marks)

(b) Calculate the benefit for each project using present worth (PW) method.

(6 marks)

(c) Calculate the disbenefit for each project using present worth (PW) method.

(6 marks)

(d) Propose justifiable project based on the benefit-cost analysis.

(7 marks)

-END OF QUESTIONS –

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Interest Table

JADUAL 15 - Aliran Tunai Diskret: Faktor Faedah Kompaun **i = 10%**

n	Single Payments		Uniform Series Payments				Arithmetic Gradients	
	Compound Amount F/P	Present Worth P/F	Sinking Fund A/F	Compound Amount F/A	Capital Recovery A/P	Present Worth P/A	Gradient Present Worth P/G	Gradient Uniform Series A/G
1	1.1000	0.9091	1.00000	1.0000	1.10000	0.9091		
2	1.2100	0.8264	0.47619	2.1000	0.57619	1.7355	0.8264	0.4762
3	1.3310	0.7513	0.30211	3.3100	0.40211	2.4869	2.3291	0.9366
4	1.4641	0.6830	0.21547	4.6410	0.31547	3.1699	4.3781	1.3812
5	1.6105	0.6209	0.16380	6.1051	0.26380	3.7908	6.8618	1.8101
6	1.7716	0.5645	0.12961	7.7156	0.22961	4.3553	9.6842	2.2236
7	1.9487	0.5132	0.10541	9.4872	0.20541	4.8684	12.7631	2.6216
8	2.1436	0.4665	0.08744	11.4359	0.18744	5.3349	16.0287	3.0045
9	2.3579	0.4241	0.07364	13.5795	0.17364	5.7590	19.4215	3.3724
10	2.5937	0.3855	0.06275	15.9374	0.16275	6.1446	22.8913	3.7255
11	2.8531	0.3505	0.05396	18.5312	0.15396	6.4951	26.3963	4.0641
12	3.1384	0.3186	0.04676	21.3843	0.14676	6.8137	29.9012	4.3884
13	3.4523	0.2897	0.04078	24.5227	0.14078	7.1034	33.3772	4.6988
14	3.7975	0.2633	0.03575	27.9750	0.13575	7.3667	36.8005	4.9955
15	4.1772	0.2394	0.03147	31.7725	0.13147	7.6061	40.1520	5.2789
16	4.5950	0.2176	0.02782	35.9497	0.12782	7.8237	43.4164	5.5493
17	5.0545	0.1978	0.02466	40.5447	0.12466	8.0216	46.5819	5.8071
18	5.5599	0.1799	0.02193	45.5992	0.12193	8.2014	49.6395	6.0526
19	6.1159	0.1635	0.01955	51.1591	0.11955	8.3649	52.5827	6.2861
20	6.7275	0.1486	0.01746	57.2750	0.11746	8.5136	55.4069	6.5081
21	7.4002	0.1351	0.01562	64.0025	0.11562	8.6487	58.1095	6.7189
22	8.1403	0.1228	0.01401	71.4027	0.11401	8.7715	60.6893	6.9189
23	8.9543	0.1117	0.01257	79.5430	0.11257	8.8832	63.1462	7.1085
24	9.8497	0.1015	0.01130	88.4973	0.11130	8.9847	65.4813	7.2881
25	10.8347	0.0923	0.01017	98.3471	0.11017	9.0770	67.6964	7.4580
26	11.9182	0.0839	0.00916	109.1818	0.10916	9.1609	69.7940	7.6186
27	13.1100	0.0763	0.00826	121.0999	0.10826	9.2372	71.7773	7.7704
28	14.4210	0.0693	0.00745	134.2099	0.10745	9.3066	73.6495	7.9137
29	15.8631	0.0630	0.00673	148.6309	0.10673	9.3696	75.4146	8.0489
30	17.4494	0.0573	0.00608	164.4940	0.10608	9.4269	77.0766	8.1762
31	19.1943	0.0521	0.00550	181.9434	0.10550	9.4790	78.6395	8.2962
32	21.1138	0.0474	0.00497	201.1378	0.10497	9.5264	80.1078	8.4091
33	23.2252	0.0431	0.00450	222.2515	0.10450	9.5694	81.4856	8.5152
34	25.5477	0.0391	0.00407	245.4767	0.10407	9.6086	82.7773	8.6149
35	28.1024	0.0356	0.00369	271.0244	0.10369	9.6442	83.9872	8.7086
40	45.2593	0.0221	0.00226	442.5926	0.10226	9.7791	88.9525	9.0962
45	72.8905	0.0137	0.00139	718.9048	0.10139	9.8628	92.4544	9.3740
50	117.3909	0.0085	0.00086	1163.91	0.10086	9.9148	94.8889	9.5704
55	189.0591	0.0053	0.00053	1880.59	0.10053	9.9471	96.5619	9.7075
60	304.4816	0.0033	0.00033	3034.82	0.10033	9.9672	97.7010	9.8023
65	490.3707	0.0020	0.00020	4893.71	0.10020	9.9796	98.4705	9.8672
70	789.7470	0.0013	0.00013	7887.47	0.10013	9.9873	98.9870	9.9113
75	1271.90	0.0008	0.00008	12709	0.10008	9.9921	99.3317	9.9410
80	2048.40	0.0005	0.00005	20474	0.10005	9.9951	99.5606	9.9609
85	3298.97	0.0003	0.00003	32980	0.10003	9.9970	99.7120	9.9742
90	5313.02	0.0002	0.00002	53120	0.10002	9.9981	99.8118	9.9831
95	8556.68	0.0001	0.00001	85557	0.10001	9.9988	99.8773	9.9889
96	9412.34	0.0001	0.00001	94113	0.10001	9.9989	99.8874	9.9898
98	11389	0.0001	0.00001		0.10001	9.9991	99.9052	9.9914
100	13781	0.0001	0.00001		0.10001	9.9993	99.9202	9.9927

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LIST OF FORMULA

1	$C_n = C_k\left(\frac{I_n}{I_k}\right)$	6	Conventional B-C ratio B-C = PW(B) ÷ [(I – PW(MV)) +PW(O&M)] B-C = AW(B) ÷ [CR + AW(O&M)]
2	$C_A = C_B\left(\frac{S_A}{S_B}\right)^x$	7	Modified B-C ratio with PW B-C = [PW(B) – PW(O&M)] ÷ [I – PW(MV)] B-C = [AW(B) – AW(O&M)] ÷ CR
3	$Z_u = K(u^{\left(\frac{Log\ s}{Log\ 2}\right)})$		
4	$p\,(1+i)^n$		
5	$I_n = \frac{W1\,(C_{n1}/C_{k2}) + W2\,(C_{n2}/C_{k2}) + W\ldots\,(C_{n\ldots}/C_{k\ldots})}{W1 + W2 + W\ldots\ldots} X\, I_k$		