KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

Department of Systems Engineering

Final Exam

Summer 2015-2016 (153)

ISE 307 Engineering Economic Analysis

Name: _____

ID: _____

Section _____SN: ___

31st August2016

Question	Points	Marks
Q1	10	
Q2	10	
Q3	15	
TOTAL	35	

IMPORTANT, to get full credit in any question, you need to show your detailed work

Q1. (10 Marks)

A U.S. company buys an asset at a cost of (I) = $700,000, with salvage value (S) =$0. The useful life of the asset is 7 years.

a. Compute the annual depreciation allowances and the resulting book values by using the DDB method with switching to the SL method. Show that the book value at the end of 7 years will be zero. (4 points)
b. Assume that the asset will be sold after 3 years at a price of $750,000 and that it would be classified as 7-year MACRS property. Calculate ordinary gains, capital gains, and net proceeds from sale if the ordinary gains and capital gains are taxed at 40% and 35%, respectively. (4 points)
c. If the company estimated its taxable income for the first year to be $18,000,000, find the marginal and average tax rates in the first year using the U.S. Corporate Tax Schedule given below. (2 points)

Taxable income	Tax rate	Tax computation
0- $15,000,000	34.33%	
$15,000,000 - $18,333,333	38%	$5,150,000 + 0.38 (D)
$18,333,333 and Up	35%	$6,416,666 + 0.35 (D)

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Q2. (10 Marks)

A Computerized Machining Center (CMC) has been proposed for small tool manufacturing company. If the new system, which costs $250,000, is installed, it will generate annual revenues of $185,000 and will require $20,000 in annual labor, $12,000 in annual material expenses and another $8,000 in annual overhead (power and utility) expenses. The CMC would be classified as a 7-year MACRS property. The company expects to dispose out the facility at the end of year 3 and will be sold for $100,000. Assume a tax rate of 35%.

a. Develop the project's cash flow over its project life by filling up the following Table.
b. Determine the net present worth (NPW) at the company's MARR of 15%? Is this project acceptable?

INCOME STATEMENT	0	1	2	3
Revenues:				
Expenses:				
Labor				
Material				
Overhead				
Depreciation				
Taxable Income				
Net Income				
CASH FLOW STATEMENT				
Net Income				
Depreciation				
Investment				
Salvage Val.				
Gain (loss) tax				
NET CASH FLOW				

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Please show your detailed calculations of the following elements:

Total depreciation:

……
……
……
……

Book Value:

……
……
……

Gain (or loss):

……
……
……

Gain tax (or credit):

……
……
……

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Q3. (15 Marks)

(i) (9 Marks)

Higgins Machine Tools, Inc. is currently manufacturing one of its products on a hydraulic stamping press machine. The machine has a current operating and maintenance cost of $50,000, and this cost is expected to increase by $5,000 each year. The machine has a remaining useful life of five years and could be sold on the open market now for $100,000. Its market value declines at a rate of 17%. A new machine would cost $200,000, and its operating and maintenance cost is expected to be $33,000 each year. The new machine has an expected service life of five years and its market values reduces at a rate of 20%.

The required MARR is 15%. The firm does not expect a significant improvement in the machine's technology to occur, and it needs the service of either machine for an indefinite period of time.

a) Fill the following tables for the defender & the challenger.

Defender		
n	**Market Value**	**O&M Cost**
0	$100,000	
1		$50,000
2		
3		
4		
5		

Challenger		
n	**Market Value**	**O&M Cost**
0	$200,000	
1		$33,000
2		
3		
4		
5		

b) Find the economic service life for the defender and its cost.

c) Find the economic service life for the challenger and its cost.

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(ii) (6 Marks)

The following data for a defender and a challenger in the tables given below show the market value, operation and maintenance cost (O&M Cost), capital recovery cost (CR), annual operation cost (AOC) and annual equivalent cost (AEC). Assuming 15% MARR and that the service of either machine is needed for an indefinite period of time:

Defender					
n	**Market Value**	**O&M Cost**	**CR(15%)**	**AOC(15%)**	**AEC(15%)**
0	$200,000				
1	$160,000	$100,000	$70,000	100000	$170,000
2	$128,000	$111,000	$63,488	105116.3	$168,605
3	$102,400	$122,000	$58,107	109978.4	$168,085
4	$81,920	$133,000	$53,647	114588.8	$168,236
5	$65,536	$144,000	$49,943	118951	$168,894
6	$52,429	$155,000	$46,858	123069.1	$169,927

Challenger					
n	**Market Value**	**O&M Cost**	**CR(15%)**	**AOC(15%)**	**AEC(15%)**
0	$450,000				
1	$337,500	$60,000	$180,000	$60,000	$240,000
2	$253,125	$60,000	$159,070	$60,000	$219,070
3	$189,844	$60,000	$142,419	$60,000	$202,419
4	$142,383	$60,000	$129,105	$60,000	$189,105
5	$106,787	$60,000	$118,404	$60,000	$178,404
6	$80,090	$60,000	$109,757	$60,000	$169,757

a) Find the economic service life for the defender and the challenger and their cost.
b) Using marginal analysis, determine when the defender should be replaced by the challenger.

Note: Show all details of your solution and show all results rounded to the nearest integer. If a problem can be solved by a series, you are required to solve it as a series, otherwise you will be penalized.

IMPORTANT, to get full credit in any question, you need to show your detailed work