

NAME

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Department of Electrical Engineering

Spring Semester Examination 2020, Date:22/06/2020  
Final term Examination

Course Code:	<u>HSS-460</u>	Course Title:	<u>Engineering E &amp;M</u>				
Prerequisite:	<u>None</u>	Instructor:	<u>Jehanzeb Khan</u>				
Module:	<u>6</u>	Program:	<u>BEE</u>	Total Marks:	<u>50</u>	Time Allowed:	<u>6 Hours (online)</u>

Note: Attempt all questions. Marks

- Q.1 (a) A property dealer in Hayatabad township has an option to purchase a twenty Marla plot that will be worth Rs.100 Million in six years. If the value of the plot increases at 8%, how much the property dealer is willing to pay for this property? 5
- (b) MR. Hamza an employee of Iqra national university on retirement from service received a lump sum amount of Rs.10 Million. He wishes to distribute to his four children at the rate of Rs. one Million per year. If the 10 Million amounts are deposited in a bank account that earns 6% interest per year, how many years it will it take to completely deplete the account? 5
- Q.2 (a) Four Generators installed at Turbela Dam, if undergoes a major overhaul now, its output can be increased by 30% - which translate into additional cash flow of Rs.30 Million at the end of each year for five years. If interest rate is 15% per year, how much can the WAPDA afford to invest to overhaul these Generators? 5
- (b) Suppose Mr. Zafar make 15 equal annual deposits of \$10,000 each into Summit bank account paying 5% interest per year. The first deposit will be made one year from today. How much money can be withdrawn from this bank account immediately after the 15<sup>th</sup> deposit? 5
- Q.3 (a) A Property is depreciable if it meets certain basic requirements. What are those basic requirements? 3

- (b) An MRI machine was installed at Khyber teaching hospital Peshawar in year 2018 at an initial cost of Rs 400,000 and expected to have zero salvage value at the end of useful life of 10 years. Determine the annual depreciation amount using SYD method. Tabulate the annual depreciation amounts and the book value of the air condition at the end of each year. 7
- Q4 (a) A company buys a Digital controlled (DC) machine for \$28,000 (year zero) and uses it for five years, after which time it is scrapped. The allowed depreciation deduction during the first year is \$4,000. as the equipment falls into the seven-year MACRS-property category. (The first-year depreciation rate is 14.29 %.) The cost of the goods produced by this DC machine should include a charge for the depreciation of the machine. Suppose the company estimates the following revenues and expenses, including the depreciation for the first operating year:  
 Gross income = \$50,000;  
 Cost of goods sold = \$20,000;  
 Depreciation on DC machine = \$4,000;  
 Operating expenses = \$6,000.  
 If the company pays taxes at the rate of 40% on its taxable income, what is its Net income during the first year from the project'? 5
- (b) A new convention center and sport complex has been proposed by Abbottabad development Authority at Shimla Pahari . This public project, if approved will be financed through the issue of bonds. The facility will be located near the city in a wooded area which includes a bike path, a nature trail and a pond. Because the city already owns the park, no purchase of land is necessary. List the project's benefits, costs, and any disbenefits. 5
- Q.5 (a) Star Marketing company is considering building a 30-unit apartment complex in Regi Model town. Because of the long term growth potential of the town, it is felt that Star marketing company could average 90% of full occupancy for the complex each year. If the following items are reasonably accurate estimates, what is the minimum monthly rent that should be charged if a 12 % MARR (per year) is desired? Use the AW method. 10

Land investment cost	\$50,000
Building investment cost	\$225,000
Study period	\$20 years
Upkeep expenses per unit per month	\$30
Property taxes and insurance per year	10% of the total investment

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Q1(a) A property dealer in Hayatabad Township has an option to purchase a twenty marla plot that will be worth Rs 100 million in six years. If the value of the plot increases at 8% how much property dealer is willing to pay for this property?

Ans.-

We know that

$$P = F \left( \frac{1}{1+n} \right)^n$$

putting the values we get.

$$P = 100000000 \left( \frac{1}{1+0.08} \right)^6$$

$$P = 100000000 \left( \frac{1}{1.08} \right)^6$$

$$P = 100000000 (0.6302)$$

$$P = 63020000$$

(2)

Q1(b) MR. Hamza an employee of Iqra national university on retirement from service received a lump sum amount of Rs 10 Million. He wishes to distribute to his four children at the rate of Rs 1 million per year. If the 10 million amount are deposited in a bank account that earns 6% interest per year. How many year it will take to completely deplete the amount?

Ans:

$$P = A \left[ \frac{(1+i)^n - 1}{i(1+i)^n} \right]$$

$$10000000 = 1000000 \left[ \frac{(1+0.06)^n - 1}{0.06(1+0.06)^n} \right]$$

$$\frac{10000000}{1000000} = \left[ \frac{(1+0.06)^n - 1}{0.06(1+0.06)^n} \right]$$

$$10 = \left[ \frac{(1+0.06)^n - 1}{0.06(1+0.06)^n} \right]$$

$$10 \times 0.06 (1+0.06)^n = (1+0.06)^n - 1$$

$$0.6 (1.06)^n = (1.06)^n - 1$$

$$-0.6 (1.06)^n + (1.06)^n = 1$$

$$(1.06)^n [1 - 0.6] = 1$$

③

$$(1.06)^n (0.4) = 1$$

$$(1.06)^n = \frac{1}{0.4}$$

$$(1.06)^n = 2.5$$

taking ln we get

$$\ln 2.5 = n \times \ln(1.06)$$

$$0.916 = n \times 0.0583$$

$$n = \frac{0.916}{0.0582}$$

$$n = 15.7 \text{ years}$$

$$n = 15.7 \text{ years}$$



Q2(a) Four generators installed at Turbela Dam. If under goes a major overhaul now its output can be increased by 30%. - which translate in to additional cash flow of Rs 30 million at the end of each year of for five years. If interest rate is 15% per year. How much can KIAPDA afford to invest the overhaul these generators?

Ans:

$$A = 30 \text{ million}$$

$$i = 15\% \Rightarrow 0.15$$

$$N = 5 \text{ years.}$$

As we know that

$$P = A \left[ \frac{(1+i)^n - 1}{i(1+i)^n} \right]$$

putting the above values we can get.

$$P = 30000000 \left[ \frac{(1+0.15)^5 - 1}{0.15(1+0.15)^5} \right]$$

$$P = 30000000 \left[ \frac{(1.15)^5 - 1}{0.15(1.15)^5} \right]$$

$$P = 30000000 \left[ \frac{1.0114}{0.15(1.15)^5} \right]$$

(5)

$$P = 30000000 \left[ \frac{1.0114}{0.3017} \right]$$

$$P = 30000000 [3.35227]$$

$$P = 100566000$$

Q2 (b) Suppose Mr. Zafar make 15 equal annual deposits of \$10,000 each in to Summit bank account paying 5% interest per year. The first deposit per year will be made one year from today. How much money can be withdrawn from this bank account immediately after the 15<sup>th</sup> deposit?

$$A \left[ \frac{(1+i)^n - 1}{i} \right]$$

Ans:-  $A = 10000$

$$i = 5\%$$

$$N = 15 \text{ years}$$

Formula

$$F = A \left[ \frac{(1+i)^n - 1}{i} \right]$$

⑥

putting values we get.

$$F = 10000 \left[ \frac{(1 + 0.05)^{15} - 1}{0.05} \right]$$

$$F = 10000 [21.5786]$$

$$F = 215786$$

Q # 3 (a) part.

Property is depreciable if it meet the following basic requirements:-

- ① It must be used in business or held to produce income
- ② It must have useful life and the life must be longer than one year.
- ③ It must be something that wears out, decay gets used up, become absolute or lost value from natural causes.



(7)

Q 3(b)

Ans.:

Solution

$$dk = (B - SV_N) \left[ 2 \frac{(N - k + 1)}{N(N+1)} \right]$$

$$BV_k = B - \left[ 2 \frac{(B - SV_N)}{N} \right] k + \left[ \frac{B - SV_N}{N(N+1)} \right] k(k+1)$$

$$10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 55$$

$$\text{Year 1} = \frac{10}{55} = 18.18\%$$

$$\text{Year 2} = \frac{9}{55} = 16.36\%$$

$$\text{Year 3} = \frac{8}{55} = 14.54\%$$

$$\text{Year 4} = \frac{7}{55} = 12.72\%$$

$$\text{Year 5} = \frac{6}{55} = 10.91\%$$

$$\text{Year 6} = \frac{5}{55} = 9.09\%$$

$$\text{Year 7} = \frac{4}{55} = 7.27\%$$

$$\text{Year 8} = \frac{3}{55} = 5.45\%$$

$$\text{Year 9} = \frac{2}{55} = 3.636\%$$

$$\text{Year 10} = \frac{1}{55} = 1.818\%$$

Calculations for year four are

$$B = 400,000$$

$$SV_N = 0$$

$$k = 4$$

$$N = 10$$

$$dk = (B - SV_N) \left[ 2 \frac{(N - k + 1)}{N(N+1)} \right]$$

$$= (400,000 - 0) \left[ 2 \frac{(10 - 4 + 1)}{10(10+1)} \right]$$

$$= 400,000 \left[ \frac{14}{110} \right]$$

8

$$= 50909.09$$

$$BV_k = B - \left[ 2(B - SVN) / N \right] K + \left[ B - SVN \right] / N(N+1) K(K+1)$$

$$= 400,000 - \left[ 2(400,000) / 10 \right] 4 + \left[ 400,000 / 10(10+1) \right] 4(4+1)$$

$$= 400,000 - [320,000] + (3636.36) 4(5)$$

$$= 400,000 - 320,000 + 72727.2$$

$$= 152727.2$$

Calculation for I:

$$400,000 \left[ 2(10 - (1+1)) / 10(10+1) \right]$$

$$= 400,000 \left[ 2(10) / 110 \right]$$

$$\boxed{d_I = 72727.27}$$

$$BV_I = 400,000 - \left[ 2(400,000) / 10 \right] I + \left[ 400,000 / 110 \right] I(I+1)$$

$$= 400,000 - [80,000] + 7272.72$$

$$\boxed{BV_I = 327272.72}$$

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Q#4(a)

Ans:-

Gross income and expenses as stated; income-tax rate = 40%.

Find

Net income

Consider the purchase of the machine to have been made at the end of the year, zero which is also the beginning of year one.

Note that our example explicitly assumes that the only depreciation charges for year one are those for the machine a situation that may not be typically.

Item	amount.
Gross income (Revenue)	\$ 50,000

Expenses

Cost of good sold	\$ 20,000
Depreciation	\$ 2,000
operating expenses	\$ 6,000

Taxable income	\$ 20,000
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Taxes (40%)	\$ 8,000
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Net income	12,000
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(10)

Q-4(b)

Ans:-

BENEFITS:-

- Improvement of the area of abbotabad city. Image
- Potential to attract conference and convention to Abbotabad city.
  - Potential to attract professional sports franchises to the city.
  - Revenues from rental of the facility.
  - Uses of facility of civic events.

Costs:-

Architectural design of the facility  
Construction of the facility. Design  
and construction of parking facility. Facility  
operating and maintenance, cost insurance  
loss.

Dis benefits:-

loss of use of portion  
of the park, bike path, natural trail,  
and the pond, loss of wild life  
habitat in urban area.



(10) (11)

### Q5(A)

Ans:

Solution:

First of all we determine the equivalent and of all costs at the NARR of 0% per year to earn exactly 12% the annual rental income adjusted for 90% occupancy must be around the AW of cost.

$$\text{Initial Investment Cost} = \$50,000 + \$225,000$$

$$= \$275,000$$

$$\text{Taxes per year} = 0.1(\$275,000) = \$27,500$$

$$\text{Unkeep/Year} = \$30(12 \times 30)(0.9) = \$9720$$

$$\text{CR Cost/Year} = \$275,000(A/P, 12\%, 20) - \$50,000(A/F, 12\%, 20)$$

$$= \$36,123$$

(Assume that investment in land is recovered at the year of 20)

$$\text{Equivalent AW (of costs)} = \$275,000 - \$9720 - \$36123$$

$$= \cancel{\$} - \$73343$$

Therefore minimum annual rental required equals

\$73343 and with annual compounding

(12)

The monthly rental amount  $R$  is

$$R = \$ 73343 / (12 \times 30) (0.9)$$

$$R = \$ 226.36 \text{ Ans}$$