A 13

OLABISI ONABAJO UNIVERSITY
COLLEGE OF ENGINEERING AND TECHNOLOGY IBOGUN CAMPUS
DEPARTMENT OF MECHANICAL ENGINEERING
DEGREE EXAMINATION (2020/2021 Session)

COURSE: **FEG 501: ENGINEERING ECONOMY**
INSTRUCTION: Answer any 4 questions
TIME ALLOWED: 2 hours ***DATE***: August 16th, 2021

Question One

a. The engineering process employed from time a particular need is recognised until it is satisfied may be divided into number of phases. Discuss the five phases of engineering process. (10marks)
b. Establish the relationship involving interest formulae relating uniform series (annuity) to its present and future worth, (15marks)

Question Two

a. In Engineering Economics study, it is helpful to categorize investment opportunities (projects) into major groups. Identify and discuss three major groups known to you. (15 marks)
b. A coal-fired power plant has upgraded an emission control valve. The modification costs only $8000 and is expected to last 6 years with a $200 salvage value. The maintenance cost is expected to be high at $1700 the first year, increasing by 11% per year thereafter. Determine the equivalent present worth of the modification and maintenance cost at 8% per year. (10 marks)

Question Three

a. Explain the concept of Capital recovery. (10 marks)
b. Haastrup Pizza, which is located in Ibogun Fasina, fares very well with its competition in offering fast delivery. Many students at the area universities and community colleges work part- time delivering orders made via the web. The owner, Femi, a mechanical engineering graduate, plans to purchase and install five portable, in-car systems to increase delivery speed and accuracy. The systems provide a link between the web order-placement software and the On-Star system for satellite-generated directions to any address in the area. The expected result is faster, friendlier service to customers and larger income. Each system costs $4600, has a 5-year useful life, and may be salvaged for an estimated $300. Total operating cost for all systems is $1000 for the first year, increasing by $100 per year thereafter. The MARR is 10%. Perform an annual worth evaluation for the owner that answers the following questions:
   i. How much new annual net income is necessary to recover the investment at the MARR of 10% per year? (5marks)
   ii. Femi estimates increased net income of $6000 per year for all five years. Is this project financially viable at the MARR? (5marks)
   iii. Based on the answer in part (b), determine how much new net income Haastrup Pizza must have to economically justify the project. Operating costs remain as estimated. (5marks)

Question Four

a. The Haastrup Mining Company has purchased 9 computer – controlled ore – grading unit for 8 ₦ 80, 000. The unit has an anticipated life of 10years and a salvage value of ₦ 10, 000. Use the DB method to develop a schedule of depreciation and book values for each year. (10 marks)
b. St. Haastrup Industries is a major producer of diverter dampers used in the gas turbine power industry to divert gas exhausts from the turbine to a side stack, thus reducing the noise to acceptable levels for human environments. Normal production level is 60 diverter systems per month, but due to significantly improved economic conditions in Asia, production is at 72 per month. The following information is available.

Fixed costs FC = $2.4 million per month

Variable cost per unit v = $35,000
Revenue per unit r = $75,000

i. How does the increased production level of 72 units per month compare with the current breakeven point? (5marks)
ii. What is the current profit level per month for the facility? (5marks)
iii. What is the difference between the revenue and variable cost per damper that is necessary to break even at a significantly reduced monthly production level of 45 units, if fixed costs remain constant?(5 marks)

Question Five

a. The need for a replacement study can arise from several situations. Outline and discuss three of such situations.(10 marks)
b. Current machine is 1 year old, **i** = 20%
Rescale value = ₦ 12'500 today
- ₦ 8'000 in 1 year
- ₦ 5'000 in 2 years
- ₦ 2'200 in 3 years

Annual expenses = ₦ 8'900 in year 1
- ₦ 10'500 in year 2
- ₦ 12'500 in year 3

Determine the economic life of the machine @ **i** = 20%. (15marks)

Question Six

A company is thinking of investing in a new production process. It needs to expend ₦ 600'000 on new machines with estimated lives of 5years. They are expected to have no appreciable salvage values at the end of the project. The accountant and the industrial engineer (IE) are at loggerhead as to which funding option is the more beneficial. The accountant wants the company to commit only ₦ 450'000 of company funds, while the balance is source at 20% from finance houses. The IE on the other hand wants no company funds committed – i.e. all required funds should be borrowed. If project is expected to bring in net revenue of ₦ 230'000 per annual, and loan obligations are to be met in equal instalments (with the principal repayment at end of project life) and assuming the current corporate tax rate is 35%, which option is better? (25marks)

$-12500(A/P\ 20\%\ 2) + 5000(A/F\ 20\%\ 2)$
$-8900(P/F\ 20\%\ 1)(A/P\ 20\%\ 2) + 10{,}500(A/F\ 20\%\ 2)$
$-12500(0.6545) + 5000(0.4545)$
$-8900(0.8333)(0.6545) - 10500(0.4545)$
$-14{,}081.$
$-15{,}535$

4	8048	34831
5	6538	28293
6	5311	22982
7	4314	18,668
8	3504	15164
9	2846	12318
10	2312	10,006