

28

Program: B. Sc. in EEE
Semester: 7th

Date: 9 December 2023
(Afternoon)
Time: 1:30 PM to 4:30 PM

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Semester Final Examination
Course Number: Hum 4721
Course Title: Engineering Economics

Winter Semester: 2022 - 2023
Full Marks: 150
Time: 3 Hours

There are 6 (Six) Questions. Answer **all the** Questions. The symbols have their usual meanings. Marks of each Question and corresponding CO and PO are written in brackets. Assume reasonable values, if necessary.

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- 1. (a) Categorize six types of investment appraisal criteria with their significant characteristics. (12) (CO3) (PO2) (06)
 - (b) An investment project provides cash inflows of BDT 350,000 per year for five years. Calculate the payback period, if the cost of the machine of the project requires BDT 650,000 at the beginning of the project. (CO4) (PO3) (07)
 - (c) AGC started a new project where they expect incremental annual revenue of BDT 50,000 for the next ten years, and the estimated incremental cost for earning that revenue is BDT 20,000. The initial investment required to be made for this new project is BDT 200,000. Based on this information, you are required to calculate the accounting rate of return for the economic decision. (CO4) (PO11)

 - 2. (a) AGC has received a contract worth \$7,300,000 to build navy flight simulators for U.S. Navy pilot training over two years. For some defense contracts, the U.S. government makes an advance payment when the contract is signed, but in this case, the government will make two progressive payments: \$4,300,000 at the end of the first year and the \$3,000,000 balance at the end of the second year. The expected cash outflows required in order to produce these simulators are estimated to be \$1,000,000 now, \$2,000,000 during the first year, and \$4,320,000 during the second year. Assume that the contractor's MARR is 15%. (12) (CO4) (PO11)
 - (i) Compute the values of the i^* s for this project.
 - (ii) Make an accept-or-reject decision on the basis of the results of part (i).
 - (b) MZA Company expects to purchase a new asset for automated rice handling. Most likely estimates are a first cost of \$80,000, zero salvage value, and a cash flow before taxes (CFBT) per year t that follows the relation $27,000 - 2000t$. The MARR for the company varies over a wide range from 10% to 25% per year for different types of investments. The economic life of similar machinery varies from 8 to 12 years. Evaluate the sensitivity of PW by varying (a) MARR, while assuming a constant n value of 10 years, and (b) n , while MARR is constant at 15% per year. Perform the sensitivity analysis by hand. (13) (CO4) (PO3)

3. (a) Interpret the conceptual difference between the benefit-cost ratio and the profitability index with physical significance. (10)
(CO2)
(PO11)
- (b) A public project being considered by a local government has the following estimated benefit-cost profile in BDT: (15)
(CO4)
(PO11)

n	b_n	c_n	A_n
0		10	-10
1		10	-10
2	20	5	15
3	30	5	25
4	30	5	22
5	30	5	12

Assume that $i = 10\%$, $N = 5$ and $K = 1$.

- (i) Compute B , C , I , C' , and BC (10%).
(ii) Compute probability index (7%) and determine whether it is worth funding the program.

4. (a) Describe the accounting depreciation with their primary purposes. (06)
(CO2)
(PO11)
- (b) Consider the following accounting information for a computer system: (08)
(CO4)
(PO3)
Cost basis of the asset (I) = BDT 10,000;
Useful life (N) = 5 years;
Estimated salvage value (S) = BDT 2,000.
Compute the annual depreciation allowances and the resulting book values using the double-declining-balance depreciation method.
- (c) The average cost in BDT of family of four members to attend a game is given (11)
(CO4)
(PO3)
as 276.24, 287.84, 313.83, 320.71, 326.45, 334.78 and 339.01 for year of 2005, 2006, 2007, 2008, 2009, 2010 and 2011, respectively.
(i) Evaluate the specific inflation rate for each period.
(ii) Determine the average inflation rate over the six-year time period.

5. (a) State three methods of determining the project risk assessment with physical significance. (06)
(CO1)
(PO1)
- (b) Categorize the factors to be estimated for making a major capital investment during the analysis of the project risk. (07)
(CO3)
(PO2)

- (c) TFA Corporation had a gross income of BDT 34,000,000 in tax-year 1, BDT 5,000,000 in salaries, BDT 4,000,000 in wages, BDT 1,000,000 in depreciation expenses, a loan principal payment of BDT 200,000, and a loan interest payment of BDT 210,000. Assume the marginal tax rates as 15% for BDT (0-50,000), 25% for BDT (50,001-75,000), 34% for BDT (75,001-100,000), 39% for BDT (100,001-335,000), 34% for BDT (335,001-10,000,000), 35% for BDT 10,000,000 and up. (12)
(CO4)
(PO3)
- (i) Calculate the taxable income in tax-year 1.
 - (ii) Compute the income tax in tax-year 1.
 - (iii) Calculate the marginal tax rate in tax-year 1.
 - (iv) Compute the average tax rate in tax-year 1.
 - (v) Determine the net income of the company in tax-year 1.
6. (a) Interpret inflation and explain the effects of inflation on project cash-flow analysis. (06)
(CO2)
(PO11)
- (b) Classify various costs along with their financial statements in the project cash-flow analysis. (07)
(CO3)
(PO2)
- (c) AG Company expects the following financial results from a project during its first year operation: (12)
(CO4)
(PO3)
Sales revenue: BDT 500,000; Variable costs: BDT 250,000; Fixed costs: BDT 150,000; Total unit produced and sold: 25,000 units.
- (i) Compute total income before tax.
 - (ii) Compute the contribution margin in units sold and in sales dollars.
 - (iii) Compute the break-even point in units sold.
 - (iv) Compute number of units that would have to be sold each year to earn a minimum target of net income of BDT 50,000.