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

Date: 10 October 2023
Time: 2.30 p.m. to 4.00 p.m.

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid-Semester Examination
Course Number: Hum 4721
Course Title: Engineering Economics

Winter Semester: 2022 - 2023
Full Marks: 50
Time: 1 Hour 30 Minutes

There are **3 (Three)** 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) Illustrate the four fundamental principles in the decision making of engineering economics with their major characteristics. **(04) (CO2) (PO11)**

(b) Calculate the net cash flow from the operating activities in a private limited company having the following summarized cash book. **(07) (CO4) (PO3)**

Particulars	USD	Particulars	USD
To Depreciation	65,000	By Gross Profit	395,000
To Rent	75,000	By Profit on Sale of Building	75,000
To Administrative Expenses	55,000	By Profit on Sale of Furniture	65,000
To Salaries	65,000	By Income Tax Refund	35,000
To Loss on Sale of Plant	25,000		
To Provision for Bad Debts	65,000		
To Goodwill Written Offer	35,000		
To Loss on Sale of Machinery	25,000		
To Provision for Tax	25,000		
To Proposed Dividend	50,000		
To Net Profit	85,000		
Total	570,000	Total	570,000

(c) Calculate the net cash flow from the investing activities in a private limited company having the following summarized cash book. **(08) (CO4) (PO3)**
Additional information is given as follows:
(i) Depreciation charged on furniture during the year was USD 20,000.
(ii) Depreciation charged on machinery during the year was USD 30,000.

(iii) Machinery, the book value on which was USD 80,000, sold for USD 70,000.

(iv) Land was sold at a profit of USD 100,000.

Particulars	2018-2019 [USD]	2019-2020 [USD]
Furniture	150,000	200,000
Machinery	1,650,000	1,800,000
Building	2,500,000	2,000,000
Land (At cost)	2,000,000	1,500,000
Investing (Long Term)	100,000	250,000

2. (a) Analyze the terms "Discounting" and "Compounding" with their major advantages and disadvantages. **(04) (CO3) (PO2)**

(b) Classify with the graphical representation the following three cash flow series as either simple or nonsimple investments: **(07) (CO4) (PO11)**

	Net Cash Flow		
Period *n*	Project *A* [USD]	Project *B* [USD]	Project *C* [USD]
0	– 1,000	– 1,000	1,000
1	– 500	3,900	– 450
2	800	– 5,030	– 450
3	1,500	2,145	– 450
4	2,000		

(c) A company needs to raise USD 55 million for a project. Company's target capital structure calls for a debt ratio of 0.4, indicating that USD 33 million has to be financed from equity and it is planning to raise USD 33 million from the financial markets. (i) Determine the cost of equity to finance the plant modernization, if the beta is 2.0, the risk-free interest rate is 5.47%, and the average market return is 13%. (ii) Determine the after-tax cost of debt, if it decided to finance the remaining USD 22 million by securing a term loan and issuing 20-year USD 1,000 per bonds under the following conditions: **(08) (CO4) (PO3)**

	Interest		
Source	Amount [USD]	Fraction	Rate
Term loan	6.6 million	0.30	12.16% per year
Bonds	15.4 million	0.70	10.74% per year

The marginal tax rate is 40%, which is expected to remain constant in the future.

3. (a) Explain the project selection rules under the internal rate of return (IRR) criterion. **(04) (CO1) (PO1)**

(b) Calculate the effective interest rate per quarter at a nominal rate of 8% compounded (i) weekly, (ii) daily, (iii) monthly, and (iv) continuously. **(08) (CO4) (PO3)**