TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2080 Baishakh**

| Exam. | Back | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEI | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

## *Subject:* -Engineering Economics *(CE 615)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*



1. Explain the roles of engineer in economic decision of any enterprise. [4]
2. Distinguish between nominal and effective interest rates. You have just purchased 100 shares of ABC company at RS.100 per share, hoping to sell the stock at double the market price. If the stock price is expected to increase by 20% per year. How long do you wait before selling the stock? [2+4]
3. a) Differentiate between Financial and Economic analysis of a Project. [2]

   b) Evaluate IRR of the following project and decide whether the project is acceptable or not? Also draw investment Balance diagram. Use AW formulation for calculation. [8]

   Initial investment = Rs. 50,000
   Annual Revenue = Rs. 20,000
   Salvage value = Rs.10,000
   Useful life = 6 years
   MARR = 10%

   c) Calculate both types of BCR of a project with following details. [8]

   MARR = 15%

   Initial Investment = Rs. 20,000

   Annual income = Rs.2000 at the end of first year and increases by 15 % every year.

   Annual expense = Rs. 100 at the beginning of first year and increases by Rs. 50 per year.

   Salvage Value = Rs. 2500

   Useful life = 12 years.

4. a) Compare repeatability assumption and co-terminated assumption as per their suitability. [4]

   b) Select the best project using IRR method if MARR = 10% and market value at the end of useful life of each project is zero. [8]

| Project | A | B |
|---|---|---|
| Initial investment | 3500 | 5000 |
| Annual Benefit | 1900 | 2500 |
| Annual O and M | 645 | 1383 |
| Useful life | 4 years | 8 years |

5. A company is contemplating replacing a machine having a current market value of Rs. 9,000 which decreases each year by Rs.1500 per year. Its operating cost is Rs.3000 for the first year and increases each year by 800 Rs. Per year for 5 years. The company will have to pay Rs. 18,000 for the new machine and its market value decreases by 20% per year over the previous year for five years. The new machine needs Rs.1500 for operation in the first year and this cost increases by 25 % each year. Find the annual equivalent cost of both the machines and compute the best replacement strategy if the machine is needed for 5 years. [5+5]

6. a) Perform sensitivity analysis for (i) MARR (ii) Annual Revenue and (iii) Investment from given information and identify the most sensitive parameters using sensitivity plot. [10]

   I = Rs 1000000 R = Rs 400000 O and M = Rs 100000 Sv = Rs 20000

   MARR = 15% N = 7 yrs Overhauling at the end of $4^{th}$ yr = Rs 25000

   b) What is break even analysis? How it can per performed for single and mutually exclusive alternatives? [4]

7. An asset has installed value of Rs. 60,000 and Salvage value zero. It is classed as 5 years property. Determine MACRS depreciation schedule. This asset is used for 8 years and revenue generated is Rs.15,000 first year Rs 25,000 each year thereafter. While annual operating cost is Rs. 5,000. Calculate After Tax Cash Flow if tax rate is 25 %. Is the investment of this asset profitable? Check your decision using PW method. Take MARR = 14%. [4+6+2]

8. Explain the impact of inflation on economic evaluation. Define constant dollar and actual dollar analysis. [2+2]

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| **Level** | BE | **Full Marks** | 80 |
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1. "Engineers make good decision-makers." Justify this statement. [4]
2. Compute the equivalent linear growth rupees to make economic equivalence for present deposit of Rs. 38,281.23 against one-year withdrawals at the end of two months each (6 number of linearly increased withdrawals in total) with base amount Rs. 5000 at first (at the end of 2nd months) with 12% interest rate compounding quarterly. [6]
3. a) Explain drawbacks of IRR with examples. Differentiate between financial analysis and economic analysis. [3+3]

   b) If a machine will be operated according to varying hours. 1200 hrs in the first year, 2100 hrs in the second year, 1800 hrs in the third year and 1500 hrs in the fourth year. Compute the annual equivalent saving or cost per machine hour, If the firm's MARR is 13% with annual worth of Rs. 7500. [5]

   c) Calculate ERR of the following cash flow MARR = 11%, reinvestment rate 13%. [5]

| EOY | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| C/F | -80,000 | 22,000 | 38,000 | 45,000 | -17,000 | 48,000 |

4. a) Compute the Imputed Market Value (IMV) for study period 4 years if initial investment is Rs. 1000 and market value after 8 years is Rs. 200. Take MARR = 10%. [4]

   b) Prepare all possible mutual exclusive combinations for the following properties of projects A, B, C, D and E. [4]
   - Project A and B are mutually exclusive projects.
   - Project C and D are mutually exclusive and contingent on acceptance of Project A.
   - Project E is contingent an acceptance of Project D

   c) Select the best project using ERR method. Take MARR = 10% and Reinvestment rate = 20%. [4]

| | Project ABC | Project XYZ |
|---|---|---|
| Initial investment | Rs. 12,000 | Rs. 16,000 |
| Annual revenue | Rs. 5,000 | Rs. 6,000 |
| Annual expenses | Rs. 500 | Rs. 600 |
| Useful life | 5 years | 5 years |
| Salvage value | Rs. 2,000 | Rs. 2,500 |

5. A company is considering the replacement of old machine. If the machine is repaired, it can be used for 5 more years. It can be sold to the other firm in Rs. 5000. If the machine is kept it will require an immediate overhaul (renovation) of Rs. 1200 to make it operable condition. Overhaul charge is not extended for service life. The operation cost is estimated at Rs. 2000 during first year and these are expected to increase by Rs. 1500 per year thereafter. Further market values are expected to decline by Rs. 1000 per year. The new machine cost Rs. 10000 and will have operating costs of Rs. 2000 in the first year, increasing Rs. 800 per year thereafter. Salvage Value is Rs. 6000 after one year and will decline by 15% each year. The company requires a rate of return of 15%. Determine economic life of each option and when the defender should be replaced? [12]

6. a) Perform Sensitivity Analysis of the following project over a range of ± 15% with an increment of 5% in (i) Initial Investment (ii) Net annual revenue (iii) Useful life (iv) MARR. Use AW formulation. Also draw sensitivity graph and find the order of sensitivity from high to low. [8]

   Initial investment = Rs. 5,00,000
   Net annual revenue = Rs. 1,20,000
   Salvage value = Rs. 80,000
   Useful life = 6 years
   MARR = 8%

   b) Explain with examples, how the project risk is determined using Scenario Analysis? [4]

7. a) Differentiate between tax depreciation and book depreciation. Why recovery period called as depreciable life. For I = 10,000, N = 5 yrs, SV = 2,000. Calculate depreciation amount and resultant book value using SOYD method. [2+2+2]

   b) If an organization has annual revenue generation of Rs. 18,000 and operation and maintenance cost is about Rs. 9000 annually. If cost basis of 5 years project is Rs. 80,000 then determine after tax cash flow. (Use sinking fund method of depreciation) use tax rate = 38%. [6]

8. Which project is most feasible? MARR = 12%, general inflation rate is 8%. [6]

| EOY | CF of Project A ('000') in Constant Dollar | CF of Project B ('000') in Actual Dollar |
|---|---|---|
| 0 | -800 | -1200 |
| 1 | +300 | +600 |
| 2 | +400 | +400 |
| 3 | +800 | +700 |

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