02 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ 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. Define opportunity cost. Why engineering economics is considered as important aspect for making decision for engineers? Explain. [1+3]

2. a) A bank is starting its nominal interest rate of 9% p.a and compounding quarterly. Calculate the effective interest rate (i) a year (ii) a quarter (iii) a month (iv) half year [4]

   b) If you wish to withdraw Rs 2000 at the end of 1st year and expecting to be increased by 15% pa then after till end of 8 years, what amount need to be deposited in a bank right now which has an interest of 15% pa. [4]

3. a) Find both types of B/C ratio using FW formulation from the following cash flow of a project. Initial investment = Rs 5,00,000, Revenue = Rs 5,0000 in the first year and increases by 15000 each year after that, Expenses = 30000 in the first year and increase by 5% each year after that. Salvage value at the end of 8 years = 25000. MARR = 8%. [8]

   b) Calculate both IRR and ERR. MARR = ϵ = 12%. [6]

EOY	NCR
0	-45,000
1	-4,000
2	+9,000
3	+40,000
4	+60,000
5	+10,000

4. a) Nepal government is planning to invest three irrigation projects. The detail cash flow estimation are given below (in billion) with MARR = 10% and life of each project is 20 years. [6]

	Koshi	Gandaki	Karnali
Initial cost	20,000	22,000	24,000
Annual benefit	4,000	4,500	5,000
Annual cost	1,000	1,200	1,400

Compare mutually exclusive project to invest.

   b) Use repeatability assumption to select the best project. [6]

	Project A	Project B	Project C
Initial cost	1,00,000	2,00,000	3,00,000
Annual income	25,000	30,000	45,000
Salvage value	20,000	50,000	70,000
Useful life year	6	10	15
MARR	12%		

   c) Define mutually exclusive, independent and contingent projects. How much should you deposit at present that earns 12% interest per year when you can draw Rs 10,000 per month for (i) 50 years (ii) Forever [2+2]

5. Define replacement. Explain the main reasons for replacement. Find economic service life from the following data. [1+3+8]

Initial cost = Rs 50,000

Operating cost = Rs 10,000 for the 1st year that increases by 15% thereafter

Salvage value = Decreases each year by 20% from previous value

Useful life = 7 years

MARR = 15% per year

6. Enunciate different methods of analyzing the riskiness of the project. Perform sensitivity analysis to identify the most sensitive parameter, among considered parameters by plotting the graph, using IRR computations for a project having following information over the range of ±15% (interval of 5%) for the parameters: (i) Net Annual Revenues (ii) Salvage Value (iii) Life Span [2+8]

Investment (Rs)	Net Annual Revenues (Rs)	Salvage Value (Rs)	Life of Project (Year)
80,000	25,000	10,000	12

7. a) Explain the terms depreciation, corporate tax, personal income tax and book value. Show the depreciations and book values in each year for an equipment having following details using MACRS method. [2+4]

Investment (I) = 25,00,000

Useful life (n) = 7 years

b) Perform after tax cash flow analysis to examine the feasibility of a project having investment of Rs 1,00,000 in a machine, with zero salvage value, 5 years useful life, net annual revenues of Rs 20,000 at the end of first year then after increases by Rs 10,000 pa. Use SL depreciation. Tax rate is 25%. [6]

8. Calculate the equivalent present worth of the project from the following cash flow. Assume inflation free interest rate as 5% and inflation as 10% respectively. [4]

EOY	Cash flow in Actual $
0	-7,50,000
1	3,20,000
2	3,75,000
3	3,28,000
4	2,90,000
5	5,80,000

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baisakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. State and explain principles of engineering economics. [4]
2. Define time value of money, nominal and effective interest rate. Calculate future sum at the end of 5th year when monthly deposit is Rs 6,000 for 3 years that earns 7% interest per year. [3+3]
3. a) Make investment decision for the following project by using (i) IRR (ii) B/C (iii) Discounted Payback methods. [4+4+4]

   Initial cost = Rs. 4,00,000
   Annual Revenue = Rs. 1,60,000 for the 1st year and decreases by Rs. 10,000 thereafter
   Annual Expenses = Rs. 40,000 for the 1st year and increases by Rs. 5,000 thereafter
   Salvage value = Rs. 1,00,000
   Life year = 8
   MARR = 9% per year

   b) What do you mean by financial and economic analysis? Briefly explain the concept of lifecycle costing. [2+2]
4. a) Compare following two projects by IRR method when i = 10% per year. [4]

	Initial Cost	Annual revenue	Annual cost	Salvage value	life year
Project A	5,00,000	2,00,000	50,000	80,000	7
Project B	7,00,000	3,00,000	1,00,000	1,50,000	7

   b) Select the best project by using repeatability assumption when MARR = 13% [4]

	Initial cost	Annual revenue	O and M	Life year	Salvage value
Project X	4,00,000	1,75,000	50,000	4	1,00,000
Project Y	7,00,000	2,50,000	70,000	6	1,50,000

   c) Define independent and contingent projects. Find Present worth from annual cash flow series of Rs. 5,000 forever when i = 8% per year. [1+1+2]
5. What do you mean by replacement analysis and economic service life? What are the procedures for replacement when planning horizon is infinite and finite? Calculate AECs from the following information and determine economic service life. [2+2+2+6]

   I = 18,000
   N = 8 years
   O and M = 3,000 for the 1st year and increases by 15% thereafter
   S = Decline by 20% each successive year over than previous price
   MARR = 12% per year

6. a) Explain the concept of scenario and decision tree analysis. If 20 watt CFL bulb price is Rs. 280 and 100 watt filament bulb price is Rs. 30 at market but their lighting power is equal. Which bulb do you prefer to use in your house when electricity cost is Rs. 12 per unit? [6]

   b) Perform sensitivity analysis for the following project over range of ±30% in parameters; (i) Initial investment (ii) Annual revenue (iii) life year [6]

Initial Cost	Rs. 5,00,000
Annual revenue	Rs. 1,20,000
Salvage value	Rs. 80,000
Life year	6 year
MARR	10% per year

7. a) Define depreciation. What are the advantages of depreciation concept? Your college is considering purchase vehicle of Rs. 4,00,000 that assigned to 5 years useful life and expected salvage value is Rs. 1,00,000. Calculate depreciation for each year by using declining balance and MACRS. [1+2+3+3]

   b) What do you mean by tax, personal tax and corporate tax? Develop a model to calculate after tax cash flow. [1+1+1+2]

8. What is inflation? List out the impact of inflation. Calculate the rate of inflation when CPI moves from 100 to 250 over three years. [1+2+1]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. Define term Engineering economy. Explain principles of engineering economy. [1+3]

2. a) If you make equal monthly deposits of Rs. 5000 into the bank for 10 years, saving accounts that pays interest rate of 6% compounded monthly, what would be the amount at the end of 15 years? [4]

   b) How much rupees should you deposit now so that you will be able to draw Rs.5000 at the end of this month which increases by 2 percent per month for 15 years. Bank interest rate is 5% per year. [4]

3. a) Explain any two drawbacks of IRR with example. Differentiate between Economic analysis and financial analysis. [3+3]

   b) Evaluate the project by using AW formulation of the project at i = 12%. [4]

EOY	0	1	2	3	4	5
Cash flow	-3000	800	1000	1100	1210	1464

   c) Calculate the ERR of the following cash flow. MARR = 12%, reinvestment rate = 14%. [6]

EOY	0	1	2	3	4	5
Cash flow	-100,000	25,000	40,000	-10,000	50,000	50,000

4. a) Choose the best project among these alternatives using IRR, if MARR = 15% and study period is 10 years. Salvage value is 20%. [6]

Project	A	B	C	D
First Cost Rs.	900	1500	2500	4000
Annual Revenue Rs.	150	276	400	925

   b) Consider the following two mutually exclusive alternatives; recommend the best alternatives using repeatability assumptions. MARR = 15% [16]

	Project X (Rs.)	Project B (Rs.)
Initial Cost	100,000	150,000
Annual Cost	25,000	12,000
Salvage Value	40000	50000
Useful Life	6 years	10 years

5. Define defender and challenger and Explain economic service life. Company X is going to purchase a router having initial cost Rs.18,000 having salvage value of Rs.12000 at the end of first year and decreases by 20% each year then after for remaining useful life. Annual operation and maintenance cost is Rs. 5000 in first year and increases by Rs.2000 each year. Its useful life is 6 years. Calculate economic service life of the router. [2+2+8]

6. a) A project costs Rs. 125,000 with annual revenue of Rs.65,000 and annual cost of Rs.35,000. Salvage value will be 8% of the initial investment. Perform Sensitivity analysis using PW formulation over a range of ±40% in i) Initial Investment ii) Annual Revenue iii) Useful Life and iv) MARR. Draw the sensitivity diagram and indicate the most sensitive and least sensitive parameters. [6+2]

   b) Define breakeven point and breakeven volume. How does interest rate change affect the project? [2+2]

7. a) Compute the annual depreciation allowances and the resulting book value using the double declining balance method with Switch over to straight line method.
   Cost of asset = Rs. 100,000, Useful life = 5 years, Salvage Value = 20000 [6]

   b) A company bought a machine at Rs 25000 which is expected to produce benefit of Rs 8000 per year for five years. Its salvage value at the end of five years is Rs 10000. Calculate after tax cashflow if Tax rate is 40% and depreciation is on Sinking fund method. I = 20% [6]

8. Define inflation. Calculate IRR if MARR = 12% and inflation rate is 8%. [1+3]

Year	0	1	2	3	4
Constant Dollar	-6000	1500	2000	2500	3000

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ 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. Define Engineering Economics. Write down the principles of Engineering Economic Analysis. [4]

2. What is nominal and effective interest rate? Evaluate FW at the end of 10 years with 12% interest rate compounded monthly of a cash flow of Rs. 40,000 at the beginning of each year for 5 years. [2+4]

3. a) Use IRR method to evaluate following project when MARR is 15%. Make also unrecovered balance graph. [5]

EOY	0	1	2	3	4	5
Cash flow	-60,000	20,000	40,000	-40,000	50,000	70,000

b) Your college is considering to purchase a vehicle of Rs. 3,00,000 expecting salvage value Rs 50,000 at the end of 10^{th} year. The use of vehicle saves Rs. 80,000 per year. When it needs Rs. 20,000 operating cost for each year. Find: (i) Both type of B/C ratio by FW formulation (ii) both types of payback period. [4+4]

c) Distinguish between financial and economic analysis. [2]

4. a) Compare the following two mutually exclusive projects by using (i) Co-terminated (ii) Repeatability assumption taking MARR = 8% [4+4]

	Project A	Project B
Initial cost	1,50,000	2,00,000
Annual revenue	90,000	1,00,000
Operating cost	20,000	20,000
Life year	4	6
Salvage value	80,000	1,20,000

b) Define mutually exclusive, contingent and independent projects with suitable example. [3]

5. What are the procedure for replacement analysis when planning horizon is infinite? [4+8]

Find economic service life from the following information.

Initial cost = Rs 50,000

Operation cost = Rs 10,000 for the 1^{st} year and increases by 15% thereafter

Salvage value = Decline each successive year by 20% over previous year.

Useful life = 8 years

MARR = 15%

6. Explain about the decision tree analysis. Perform sensitivity analysis of the following project over range of ±30% at an interval of ±10% in (i) Initial Investment (ii) Net Annual Revenue and (iii) Useful life. Use PW formulation. [2+10]

Initial Investment (Rs)	1,00,000
Net Annual Revenue (Rs)	40,000
Salvage Value (Rs)	15,000
Useful life (years)	6
MARR (%)	10

7. Write down the causes for depreciation of assets. If a machine costing of Rs. 1,00,000 is purchased by expecting salvage value of Rs 20,000 at the end of 6^{th} years. Calculate the depreciation amount for each years by SOYD and straight line method. [2+5+5]

8. Define constant dollar and actual dollar amount. Suppose you borrowed Rs.1,20,000 from a bank to buy a bike and you have promised to pay Rs.6000 per month for two years. What is the inflation free interest rate you are supposed to pay if average inflation rate is 0.75% per month. [4+4]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ 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. Define Engineering Economics. Write down the principles of Engineering Economic Analysis. [4]

2. What is nominal and effective interest rate? Evaluate FW at the end of 15 years with 10% interest rate compounded monthly of a cash flow of Rs. 50,000 at the beginning of each year for first 10 years. [3+5]

3. Define IRR. Find IRR and ERR of the following project. MARR = ε = 15%. [2+6]

Year	0	1	3	4	5
Cash flow	-50	-10	30	40	50

4.

	Machine A
Initial Investment	Rs. 6000
Annual Benefits	Rs. 3000
O & M Cost	Rs. 1000
Salvage Value	Rs. 1500
MARR	10%

a) Evaluate both type of BCR (FW Formulation). Take Useful life = 10 years. [4]
b) Evaluate both type of Payback Period. If Useful life = 5 years. (Take Standard payback period = 3 years) [4]
c) Explain the factors affecting determination of MARR. [4]

5. a) Use Repeatability assumption to select the best project from the following three projects. [6]

Project	A	B	C
Initial Investment	100000	200000	250000
Annual Expenditure	25000	20000	15000
Useful Life, Years	3	5	7
Salvage Value	40000	50000	60000
MARR	14%		

b) Explain about the Sunk Cost, Economic life and reasons for replacement of an asset. The Annual Equivalent Cost of defender and challenger are given in the table below. What is the best replacement strategy? Use MARR = 10%. The planning horizon of the project is 8 years. [8+4]

End of year (n)	1	2	3	4	5	6
$(AEC)_D$	5400	5200	5500	5700	6200	6600
$(AEC)_C$	7700	6200	5700	5600	5680	5900

6. a) For the improvement of a manufacturing plant, following three alternatives are being considered. The estimated investments and the corresponding increment in income are also given as below. Draw decision tree diagram of the situation and decide on the best alternative using FW formulation. MARR = 15%. Life of the Project is 6 years. [6]

Alternatives	Investment Cost	Sales		Annual Income
A	1000000	High Success Medium Success Low Success	Probability = 0.4 Probability = 0.5 Probability = 0.1	500000 300000 125500
B	600000	High Success Medium Success Low Success	Probability = 0.2 Probability = 0.5 Probability = 0.3	400000 250000 100000
C	400000	High Success Medium Success Low Success	Probability = 0.5 Probability = 0.1 Probability = 0.4	200000 125000 50000

b) Perform sensitivity analysis of the following project over a range of 10 to 50 percent in (i) initial investment and (ii) MARR using PW formulation. Assume Sv = 0. Draw sensitivity diagram also. Rs 100000, Income = Rs 40000, useful life 6 yr. [6]

7. What do you mean by depreciation? Explain about the causes of it. Explain about any three methods of depreciation calculation that are used commonly. A machine purchased for Rs. 60,000 by expecting useful life of 10 years. Calculate the depreciation amount for each year by using deciding balance method when rate of depreciation is 20% per year. [6+6]

MARR = 10%

8. Define Constant dollar amount and Actual dollar amount. Suppose you borrowed Rs. 100000 from a bank to buy a bike and you have promised to pay Rs. 5500 per month for two years. What is the inflation free interest rate you are supposed to pay if average inflation rate is 0.75% per month? [2+4]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2070 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. Scarcity is an emerging issue in engineering field. How does the study of economics help to engineers in decision making process? Discuss. [5]
2. What is effective and nominal interest rate? Evaluate FW at the end of 10 years with 8% interest rate compounded continuously of a cash flow of Rs. 500 at the beginning of each year for first 5 years. [2+4]
3. Initial Investment = Rs. 100,000 [6+5+5]
   Salvage Value = 0
   Annual O&M Cost = Rs. 20,000
   Useful Life = 5 years
   Annual Benefit = 60,000 at the end of first year, thereafter decreases by 4,000 each year for the remaining years.
   a) Draw U/B diagram.
   b) Evaluate conventional BCR using PW formulation. Take salvage value = 10,000.
   c) Evaluate Discounted Payback Period. Take standard (cut off) Payback Period = 3 years.
4. Use IRR method to select best project. MARR = 12%. [8+4]

	A	B	C	D
Initial Investment	1100	1500	2750	2000
Annual Income	500	700	1200	950
Useful Life	4	4	4	4
Salvage Value	250	500	800	1000
MARR	✓ 15%			

   Select the best combination if A, B and C are mutually exclusive.
5. Explain about the reasons for replacement of asset. The Annual Equivalent Cost (AEC) of the defender and challenger are given in the table below. What is the best replacement strategy? Use MARR = 12%. The planning horizon of the project is 8 years. [4+8]

End of Year (n)	1	2	3	4	5	6
$(AEC)_D$	5300	5250	5400	5750	6200	6550
$(AEC)_C$	7700	6150	5700	5600	5675	5800

6. What are the sources of risk in engineering projects in Nepal? A real-state developer seeks to determine the most economical height for a new office building which will be sold after five years. The relevant net annual revenues and net resale values are as given below. [4+8]

	Height	
	4 Floors	5 Floors
First Cost	125,000,000	200,000,000
Annual Revenues	19,910,000	37,815,000
Net Resale Value	200,000,000	300,000,000

The developer is uncertain about the interest rate i to use, but is certain that it is in the range of 5 to 30%. For each building height, find the range of values of i for which that building height is the most economical. Draw sensitivity diagram to support your answer.

7. An asset has installed value of 45,000. $S_s = 0$. It is classed as a 5 year property. Determine approximate MACRS depreciation schedule. Over 6 years it is estimated to generate revenue of Rs. 23,000 per year with annual operating cost 7300. Required rate of return = 15% after tax. Tax rate = 40%. Evaluate after tax IRR with annual worth method. [6+6]

8. The annual fuel cost required to operate a small solid waste treatment plant are projected to be Rs. 200000 without considering any future inflation. The best estimate indicates that the annual inflation free interest rate I' will be 6% and the general inflation rate, f, will be 5%. If the plant has the remaining useful life of four years, what is the present equivalent of its fuel costs? Use actual dollar analysis. [5]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
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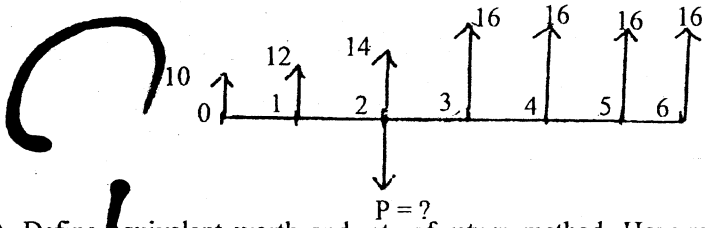
1. Explain the roles of engineers in making economic decision with appropriate examples. [4]

2. a) If you deposit Rs.10000 in a saving account now which gives 10% nominal interest rate, what will be the amount after 5 years if interest is compounded (i) semi-annually (ii) Monthly [2]

   b) Find the value of P if i=10%. Use gradient formula also. [4]



3. a) Define equivalent worth and rate of return method. How much rupees should you deposit now in a bank account that gives 8% interest per year if you wish to draw Rs.10,000 per month for 10 years? [2+4]

   b) What is the different between financial and economic analysis? Determine both type of B/C ratio from the following cashflow. [2+4]

   Initial investment = 3,00,000
   Annual revenue = 85,000
   Annual costs = 15,000
   Salvage value = 20% of initial investment
   Useful life = 6 years
   MARR = 10%

   c) Compute IRR by using trial and error process of the following project. Determine also investment decision. [4]

   Initial investment = 25,000
   Annual revenue = 8,000
   Salvage value = 5,000
   Useful life = 5 years
   MARR = 20%

4. a) Select the best proposal using ERR (ε=25%, MARR=20%) [4]

EOY	0	1	2	3	4	5	6
Proposal A	-6400	2620	2900	3020	3100	3100	2600
Proposal B	-7550	2050	4060	4000	3900	3900	3400

   b) State and explain about the cases of mutually exclusive, contingent and independent projects with example. Compare the following projects by using repeatability assumption when MARR is 12% [4+4]

Project	A	B
Initial investment	2,00,000	3,00,000
Annual revenue	25,000	30,000
Annual costs	7,000	9,000
Useful life year	6	8
Salvage value	10,000	20,000

5. The new machine costs 10,000 operating cost 2200 in first year, then increases by 20% per year. Market value is 6000 after one year and will decline by 15% each year N = 5 years. If required, old machine can work another 3 years. Market value now is 5000 and will decline by 25% each year. Immediate overhauling to restore to operable condition costs 1200. Operating costs 2000 in the first year increases by 1500 per year thereafter. MARR = 15% [8+4]

   i) Find the economic service life of this machine (new)
   ii) AEC of defender is as followings:

(AEC)

N	1	2	3	4
AEC	5380	5203	5468	5845

When should the old machine be replaced with the new machine.

6. a) Explain decision free Analysis: [4]

   b) Calculate break-even hours of operation per year to become cost equal and recommended economic pump if it is to be operated 5 hours daily at full load. [8]

	KHASA Pump	SARVO Pump
Capacity	100 hp	100 hp
Purchase cost (Rs.)	5,00,000	10,00,000
Tax per year (Rs.)	10,000	15,000
Maintenance cost per year (Rs.)	36,500	29,200
Efficiency	80%	90%
Life year	5	5
Salvage value	20 % of purchase cost for both	
MARR	20% per year	
Electricity cost	Rs. 10/kwhr	

7. a) Define depreciation. What are the causes for it? If a machine costing of Rs. 1,50,000 is purchased by expecting salvage value Rs.40,000 at the end of 6^{th} year. Calculate depreciation amount for each years by [2+5]

      i) SOYD
      ii) Declining balance

   b) Suppose an equipment purchased for Rs.10,00,000. It is expected to generate income of Rs. 3,50,000 per year during 5 years and corporate income tax rate is 25% per year. Under the recovery periods depreciation are as follows. [6]

Year	1	2	3	4	5
Depreciation amount	1,00,000	2,00,000	2,00,000	2,00,000	1,00,000

Calculate ATCFs and determine profitability (IRR) when MARR is 15% by using PW method.

8. Evaluate the PW of the following project: [5]

Initial investment = Rs. 1,00,000 → in constant dollers
Annual sales income = Rs. 40,000 → in constant dollers
Annual labour cost = Rs. 3,000 → in constant dollers
Annual material X = Rs. 2,000 → in constant dollers
Annual material Y = Rs. 1,000 → in constant dollers
Salvage Value = 20% of initial investment - in constant dollers

Inflation rate for sales income, labour cost, materials X, material Y and salvage value are 5%, 8%, 0%, 6% and 3% respectively for the project period. Take market interest rate = 20% project life is 4 years.

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

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- ✓ *Attempt **All** questions.*
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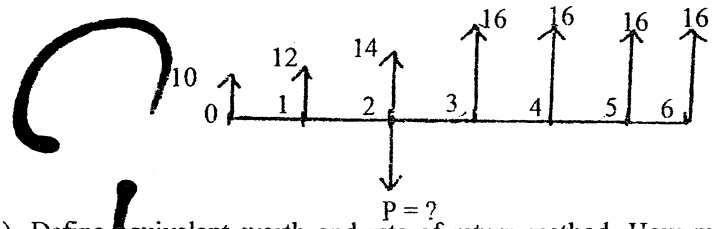
- ✓ *Assume suitable data if necessary.*

1. Explain the roles of engineers in making economic decision with appropriate examples. [4]

2. a) If you deposit Rs.10000 in a saving account now which gives 10% nominal interest rate, what will be the amount after 5 years if interest is compounded (i) semi-annually (ii) Monthly [2]

   b) Find the value of P if i=10%. Use gradient formula also. [4]



3. a) Define equivalent worth and rate of return method. How much rupees should you deposit now in a bank account that gives 8% interest per year if you wish to draw Rs.10,000 per month for 10 years? [2+4]

   b) What is the different between financial and economic analysis? Determine both type of B/C ratio from the following cashflow. [2+4]
   Initial investment = 3,00,000
   Annual revenue = 85,000
   Annual costs = 15,000
   Salvage value = 20% of initial investment
   Useful life = 6 years
   MARR = 10%

   c) Compute IRR by using trial and error process of the following project. Determine also investment decision. [4]
   Initial investment = 25,000
   Annual revenue = 8,000
   Salvage value = 5,000
   Useful life = 5 years
   MARR = 20%

4. a) Select the best proposal using ERR (ε=25%, MARR=20%) [4]

EOY	0	1	2	3	4	5	6
Proposal A	-6400	2620	2900	3020	3100	3100	2600
Proposal B	-7550	2050	4060	4000	3900	3900	3400

   b) State and explain about the cases of mutually exclusive, contingent and independent projects with example. Compare the following projects by using repeatability assumption when MARR is 12% [4+4]

Project	A	B
Initial investment	2,00,000	3,00,000
Annual revenue	25,000	30,000
Annual costs	7,000	9,000
Useful life year	6	8
Salvage value	10,000	20,000

5. The new machine costs 10,000 operating cost 2200 in first year, then increases by 20% per year. Market value is 6000 after one year and will decline by 15% each year N = 5 years. If required, old machine can work another 3 years. Market value now is 5000 and will decline by 25% each year. Immediate overhauling to restore to operable condition costs 1200. Operating costs 2000 in the first year increases by 1500 per year thereafter. MARR = 15% [8+4]

   i) Find the economic service life of this machine (new)
   ii) AEC of defender is as followings:

(AEC)

N	1	2	3	4
AEC	5380	5203	5468	5845

When should the old machine be replaced with the new machine.

6. a) Explain decision free Analysis: [4]

   b) Calculate break-even hours of operation per year to become cost equal and recommended economic pump if it is to be operated 5 hours daily at full load. [8]

	KHASA Pump	SARVO Pump
Capacity	100 hp	100 hp
Purchase cost (Rs.)	5,00,000	10,00,000
Tax per year (Rs.)	10,000	15,000
Maintenance cost per year (Rs.)	36,500	29,200
Efficiency	80%	90%
Life year	5	5
Salvage value	20 % of purchase cost for both	
MARR	20% per year	
Electricity cost	Rs. 10/kwhr	

7. a) Define depreciation. What are the causes for it? If a machine costing of Rs. 1,50,000 is purchased by expecting salvage value Rs.40,000 at the end of 6^{th} year. Calculate depreciation amount for each years by [2+5]

      i) SOYD
      ii) Declining balance

   b) Suppose an equipment purchased for Rs.10,00,000. It is expected to generate income of Rs. 3,50,000 per year during 5 years and corporate income tax rate is 25% per year. Under the recovery periods depreciation are as follows. [6]

Year	1	2	3	4	5
Depreciation amount	1,00,000	2,00,000	2,00,000	2,00,000	1,00,000

Calculate ATCFs and determine profitability (IRR) when MARR is 15% by using PW method.

8. Evaluate the PW of the following project: [5]

Initial investment = Rs. 1,00,000 → in constant dollers
Annual sales income = Rs. 40,000 → in constant dollers
Annual labour cost = Rs. 3,000 → in constant dollers
Annual material X = Rs. 2,000 → in constant dollers
Annual material Y = Rs. 1,000 → in constant dollers
Salvage Value = 20% of initial investment - in constant dollers

Inflation rate for sales income, labour cost, materials X, material Y and salvage value are 5%, 8%, 0%, 6% and 3% respectively for the project period. Take market interest rate = 20% project life is 4 years.

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03 * TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2069 Poush

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BEL,BEX BCT.	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ *Assume suitable data if necessary.*

1. a) What are the principles of engineering economics? How does it help to decision making process?
   b) Differentiate between simple interest and compound interest. How many deposits of Rs.50, 000 each should make per month so that the future amount will be Rs. 20. 00.000 if the bank interest rate is 10% per year?
2. a) An equipment costing of Rs.5,00,000 is estimated to have life of 10 years and expected annual revenue is Rs.1,10,000 with annual cost of Rs.20,000. Determine the investment decision from PW, AW, and FW method to this equipment when salvage value is Rs.1, 00,000 and MARR is 12%.
   b) Use IRR method to evaluate following project when MARR is 20%.

End of year	cash flow
0	-60,000
1	20,000
2	40,000
3	50,000
4	50,000
5	70,000

3. a) Determine both types of B/C ratio by using FW formulation.

Initial investment (Rs.)	2,50,000
Annual revenue(Rs.)	50,000 at the end of first year and increasing by Rs. 30,000 for each year
Annual O&M cost (Rs.)	30,000
Salvage value (Rs.)	50,000
Useful life year	5
MARR	15%

b) Recommend the best project from the following information by using repeatability assumption when MARR is 12%.

Project	A	B
Initial investment (Rs.)	4,00,000	7,00,000
Annual revenue (Rs.)	1,75,000	2,50,000
Annual cost (Rs.)	25,000	35,000
Salvage value (Rs.)	40,000	70,000
Useful life (year)	6	8

4. a) What do you mean by replacement analysis? Determine the choice between defender and challenger with following information from AEC approach when useful life is 5 years and MARR is 10%.

Item	Defender	Challenger
Initial investment(Rs.)	25,00,000	35,00,000
Annual cost(Rs.)	10,00,000	7,50,000
Salvage value(Rs.)	5,00,000	12,00,000

b) Define economic service life of an asset. From the following information find the economic service life of an asset.

Initial investment(Rs.)	50,000
Annual operating cost (Rs.)	10,000 for the first year and increasing by 15% over the previous year
Salvage value (Rs.)	Declining each year by 20% from the previous year's salvage value
Useful life (year)	7
MARR	15%

5. a) Perform sensitivity analysis of the following project over a range of ± 30% in i) initial investment ii) net annual revenue iii) useful life year. Draw also sensitivity diagram.

Initial investment(Rs.)	5,00,000
Net annual revenue (Rs.)	1,20,000
Salvage value(Rs.)	80,000
Useful life (year)	6
MARR	10%

b) If the cost of 25 watt CFL bulb is Rs.260 whereas the cost of 100 watt Filament bulb is Rs.35 but these bulbs have equal lighting power. Which bulb do you prefer in your use and why? When electricity cost is Rs.11 per unit (kw-hr).

6. a) What do you mean by depreciation and what are its causes? A machine purchased for Rs. 50,000 by expecting useful life of 10 years. Calculate its depreciation amount for each year by using declining balance method when rate of depreciation is 20% per year.

b) Write shot notes on

i) MACRS for depreciation

ii) Inflation and CPI

iii) Market interest rate and inflation free interest rate.

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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Bhadra

Exam.	Regular (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics *(CE655)*

- ✓ 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. Define engineering economy. Enlist the principles of engineering economy. [1+3]
2. Ramesh, a Civil Engineer is planning to place a total of 20% of his salary, which is Rs. 250000. per year now, each year in mutual fund. He expects 7% salary increase each year for next 15 years. If the mutual fund will average 10% annual return, what will be the sum-amount at the end of 15 years? If salary increases by Rs 25000 per year. What will be the amount? [4+4]
3. a) From the following cashflow [4]

EOY	0	1	2	3	4	5
Cash flow	-3000	800	1000	1100	1210	1464

Calculate both type of payback period. MARR = 10%.

b) Equipment costs 2,50,000 and has salvage value of 50,000 at the end of its expected life 5 years. Annual expenses will be 40,000. It will produce a revenue of 120,000 per year. MARR = 20%. = ε [4+4+4]

i) Evaluate IRR using AW formulation.
ii) Evaluate both type of B/C ratio with FW formulation.
iii) Find ERR.

4. From the following information select the best project.

	Project A	Project B
Initial Investment	35,000	50,000
Annual Revenue	16,450	25,000
Annual costs	3,000	13,830
Useful life	4 years	8 years
Salvage value at the end of useful life	0	0

MARR = 10%

When service period required is:

i) 4 years by FW method [4]
ii) 8 years by IRR method with PW formulation [8]

5. What is the economic service life of an asset? Find the economic service life of a new electric lift truck which costs $ 20,000, have a operating cost of $1000 in the first year and have salvage value of $12,000 at the end of the first year. For the remaining years,

operating costs increase each year by 10% over the previous years operating costs. Similarly the salvage value declines each year by 20% from the previous years salvage value. The lift truck has a maximum life of 7 years. An overhaul costing of $3000 and $5000 will be required during the fifth and seventh year of service respectively. The firm's required rate of return is 15% per year.

OR

A firm has a contract to provide printing service to IOE for next 8 years. It can provide the service using its old printing machine (the current defender) or the newly bought machine (the challenger). After the contract work neither the old machine nor the new machine will be retained. Considering the annual equivalent costs of the old machine and new machine as follows, what are their economic service life? And what is the best replacement strategy? [2+10]

Number of years (n)	Annual equivalent cost (Rs)	
	Old machine	New machine
1	515,000	750,000
2	510,000	615,000
3	550,000	586,000
4	596,000	583,000
5	644,000	590,000

6. a) Calculate breakeven volume of a cable manufacturing company from the following data: Total cost = Rs. 1,200,000; Variable cost = Rs. 400,000 Income from sales = 15,00,000. at production of 5000 unit. [4]

   b) A proposal is described by the following estimates: P = $20000, S = 0, N = 5 and net annual receipts = $7000. A rate of return of 20 percent is desired on such proposals. Construct a sensivity graph of the life, annual receipts, and rate of return for deviations over a range of ±20 percent. To which element is the decision most sensitive? [8]

7. a) Define depreciation and list out important methods of calculating depreciation deductions. [4]

   b) A machine costs Rs 15000. Its useful life is 5 years and salvage valve is Rs 900. Compute the annual depreciation allowances and resulting book values using double declining balance depreciation methods. [8]

8. a) Define inflation. List out its effects. If the inflation rate is 5% per year and the market interest rate is 13% per year. What is the implied interest (inflation free) rate in inflationary economy? [1+1+2]

OR

A series of five constant dollar (or real dollar) income (beginning with $5000 at the end of the first year) are increasing at the rate of 7% per year for five years. Inflation free interest rate is 5% and inflation is 8%. Is it feasible investment if investment cost is $20,000? [4]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BEL BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics

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

1. a) "Engineers play the important role in making the economic decision". Do you agree with this statement? Discuss. [6]

   b) The information given below shows the records of a manufacturing company comparing the actual data with the data from the standard cost card. Calculate all the variances. Also indicate the favorable and adverse variances. [10]

	Production (Units)	Direct Material (Kg.)	Direct Material cost (Rs.)	Working Days	Fixed Overheads (Rs.)	Variable overheads (Rs.)
Standard	10	50	10000	12	5000	25000
Actual	8	45	9000	10	6000	20000

2. a) Mr. Kumar has inspected his yearly household expenses for the last 10 years. Cost averages were steady at Rs 100000 per year for the first 5 years, but have increased consistently by Rs 15000 per year for each of the last 5 years. Calculate total present worth in year zero. Use gradient formula. [8]

   b) Use discounted payback period method to select the best option: [8]

	Initial Investment	Annual Income	Useful Life	Salvage Value
Option A	Rs. 1000000	Rs 15000	10 yrs	Rs 20000
Option B	Rs 150000	Rs 20000	12 yrs	Rs 40000

3. a) Find the IRR of the following cash flow of a project. If MARR = 20%, comment on the acceptability of the project. Show investment balance diagram. [8]

End of Year	Net Cash flow in RS.
0	–20000
1	+8000
2	+17000
3	+19000
4	+18000
5	–10000

   b) Three mutually exclusive alternatives are to be compared by the rate of return method and are describe below. MARR is 10%. Salvage value is 20% of first cost. Which option has the highest IRR and what is it? Recommend the best alternative. [8]

	X	Y	Z
First cost, Rs.	70,000	60,000	100,000
Annual income, Rs.	15000	10000	18000
Economic life, years	8	8	8

4. a) The total purchase price of a three room set furniture is Rs. 50000. However after a down payment of Rs 10000, two year series end of month payment of 2200 will have to be made. Determine the nominal and effective interest rate. [3+3]

b) Find the acceptability of a project using both types of B/C ration. (Use AW method) [10]

Initial investment =	Rs. 180000	Annual Benefits =	53000 at the end of first year and decreases by Rs. 2000 each year
Annual Expenses =	Rs. 16000	Salvage value =	Rs. 40000
Useful life =	10 years	MARR =	10%

5. a) Select the best project from the following two projects. (Use Repeatability and PW method). [8]

	Project A	Project B
Initial Cost (Rs)	150000	180000
Annual Expenses (Rs)	35000	31000
Annual Revenues (Rs)	8500	10500
Salvage Value (Rs)	50000	80000
Useful Life	6 years	9 years
MARR	15%	

b) Two types of power converters, alpha and beta are under consideration for a specific application. An economic comparison is to be made at an interest rate of 12% and the following cost estimates have been obtained. Select the best option by calculating present worth of both the projects if it will be operated for 4 years only. [8]

	Alpha	Beta
Purchase price Rs	750000	2000000
Annual operating cost, Rs.	200000	100000
Estimated service life, years	5	9
Salvage value, Rs.	0	400000

6. a) Following table shows the demand of meat when the price is shown in Rs. Make the hypothesized regression equation and find the consumption if the price is set to be Rs. 35 per kg. [6]

SN	Price of meat per kg	Consumption in kg
1	25	80
2	38	70
3	28	78
4	30	73
5	27	78
6	40	68
7	42	65
8	32	74

b) The purchase of a rental property is being considered in a neighborhood where real estate prices are increasing rapidly. The following estimates have been developed for a preliminary before-tax analysis: [10]

First cost, Rs	Annual income from rent, Rs.	Annual Maintenance, Rs.	Investment Period	Resale value	MARR
140000	30000	7500	6 yrs	1,50,000	10%

Construct sensitivity chart for joint variation within a ±30% range of annual income and MARR. Indicate the acceptance and rejection zones.

7. Write short notes on: (any four) [4×4]

a) Drawbacks of IRR method
b) Capital recovery cost
c) Decision tree analysis
d) Declining balance method of depreciation
e) Methods of demand analysis

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Jestha

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs

Subject: - Engineering Economics

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

1. a) Differentiate between nominal and effective interest? Calculate both nominal and effective annual interest if you deposit now, Rs 1,00,000 and you can draw Rs 1000 per month for ever. [6]

   b) A machine cost Rs 20 million with no salvage value. Rs 8 million revenues per year can be gained. Given: useful life = 4 years. Tax rate = 50%, MARR = 10%. Use straight line depreciation method to evaluate (i) PW (ii) IRR [10]

2. a) Explain decision tree analysis. [6]

   b) Select the best project using IRR method. Useful life of all projects are 15 years. MARR = 10%. [10]

Particulars	Project A	Project B	Project C
Initial investment	7500,000	5500,000	4000,000
Annual revenue	960,000	720,000	600,000
Salvage value	7500,000	5500,000	4000,000

3. a) What are the drawbacks of IRR method? How does ERR method eliminates some of these drawbacks. [6]

   b) Perform cost variance analysis. [10]

	Standard (Rs)	Actual (Rs)
Production (Units)	9,000	8,000
Direct Labour (Hours)	72,000	60,000
Direct Labour cost (Rs.)	756,000	600,000
Fixed overhead cost (Rs.)	900,000	810,000
Variable overhead cost (Rs.)	684,000	630,000

4. a) Explain the methods for assessing risk/uncertainty. [6]

   b) Perform sensitivity analysis over a range of ±30% in (i) initial investment (ii) annual net revenue (iii) useful life. [10]

Initial investment = Rs. 100,000	Salvage value = Rs 10,000
Annual benefits = Rs 25,000	Annual expenses = Rs 3,000
Useful life = 10 years	MARR = 10%

Draw sensitivity diagram and interpret the result.

5. a) Evaluate the modified B/C ratio for the problem in Q 4(b). [6]

   b) Select the best project. Required study period is 5 years. [10]

	Project P	Project Q
Initial Investment(Rs.)	5,00,000	3,50,000
Annual net revenue (Rs.)	2,00,000	1,75,000
Salvage value(Rs.)	50,000	35,000
Useful life (Years)	6	5
MARR	10%	10%

6. a) Define engineering economics. Explain capitalistic OR Socialistic economy. [6]

   b) Evaluate ERR. MARR = 10% E=8% [8]

EOY	0	1	2	3	4	5
Cash inflow	–	+40,000	+150,00	+120,000	+800,000	+200,000
Cash outflow	–480,000	–80,000	–50,000	–500,000	–200,000	–400,000

   c) What are the elements of cost? [2]

7. Write short notes: [4×4]

   a) Sources of uncertainty
   b) Market research
   c) Continuous compounding
   d) Job and process costing
   e) Statistic approach to demand analysis

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Mangsir

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics

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

1. a) Define economic system. Write advantages of socialistic economy. [1+3]

   b) Explain overhead cost and opportunity cost. [4]

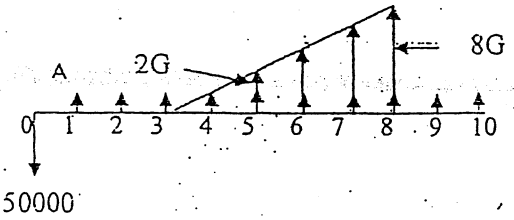
   c) The following information has been obtained from the records of a manufacturing company using standard costing system. [8]

	Estimated	Actual
Production Units	1	600
Cement (bags)	5	3,600
Cement Cost (Rs.)	3,500	2,16,000
Skilled Labour (mason) Days	2	900
Skilled Labour (mason) Cost Rs.	300 per day	325 per day
Fixed Overhead (Rs)	10,000	15,000

   Find all the variances (Including all its components)

2. a) Mr. Basnet purchases a car which cost Rs. 20,00,000. He pays 40% as down payment. Remaining amount will be paid on installment basis and wishes to pay Rs. 25,000 per month for next five years. What annual interest rate will he be paying? At the end of 3rd year, what lump sum amount should he pay to clear all his dues? [4+4]

   b) Find the value of A and G if i = 10%. A = 3G [8]



3. a) Describe any two drawbacks of IRR. [4]

   b) Use ERR method to evaluate the project with following cash flow. MARR = € = 10%. [6]

Year	1st	2nd	3rd	4th	5th	6th
Cash flow	-8,00,000	2,00,000	2,00,000	-50,000	4,00,000	4,00,000

   c) A preliminary estimate of a multipurpose hydropower project produced the following data. [6]

Initial Investment	Annual Power sales	Annual irrigation benefit	Annual recreational benefit	Annual operation and maintenance	Life of the project	Salvage value
Rs. 50 crore	Rs.8 crore	Rs. 1 crore	Rs. 2 Crore	Rs. 1.5 crore	50 yrs	Rs. 40 crore

   Give your suggestion to the government about the implementation of the project. Take MARR = 8%.

4. a) Recommend which one is best out of the following three mutually exclusive projects. Study period is 10 years MARR = 12%. [8]

Project	A	B	C
Initial Investment	5,00,000	6,00,000	7,00,000
Annual Revenues	1,50,000	1,50,000	1,70,000
Annual cost	25,000	25,000	25,000
Salvage value	1,00,000	1,00,000	70,000
Useful life	4	6	8

b) Define capitalized worth. How much money should Mr X should deposit now in a bank which gives 12% interest annually, so that he can draw (i) Rs 3000 per month plus Rs. 20,000 annually and Rs. 50,000 in every five years for infinite period. [2+6]

5. a) Explain mutually exclusive and independent projects. [4]

b) Select the best alternative using incremental IRR methods. Useful life is 10 years and salvage value is 25% of initial investment. MARR = 10%. [12]

Project	A	B	C	D
Initial Investment	600	500	800	700
Annual Revenues	150	125	175	160
Annual Cost	40	25	30	35

6. a) What will be the impact of change in value of present worth of the following project if changes occurs in (i) initial investment (ii) net annual income and (iii) Useful life by ±25%? Draw necessary graph also. [10]

Initial Investment	Rs. 4,00,000
Net Annual income	Rs 60,000
Useful life	12 years
MARR	15%

b) Based on the following data, forecast the demand of CFL for next five years. [6]

Year	2007	2008	2009	2010
Demand (Nos.)	1,00,000	1,25,000	2,00,000	3,00,000

7. Write short notes on: (any four) [4×4]

a) Taxation system in Nepal
b) Methods of calculating depreciation
c) Decision tree analysis
d) Market Research
e) Factors affecting demand

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Magh

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics

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

1. a) Explain the terms, socialistic economy and cash flow diagram. [4]

   b) In the standard card, it is observed that one unit of product 'X', requires fixed overhead of 2 hrs at the rate of Rs. 15/hr. During the month of February, 800 units are produced at the actual fixed overhead of Rs. 18/hr in 1800 hours. Budgeted fixed overhead is Rs. 30,000. Perform cost variance analysis. [6]

   c) Evaluate both type of B/C ratio using PW. [6]

   Initial cost = Rs. 25 lakh
   Salvage value = Rs. 5 lakh
   Useful life = 10 years
   Annual benefits = Rs. 10 lakh
   Annual O & M = Rs. 5 lakh
   MARR = 8%

2. a) Explain incremental analysis or break-even analysis. [4]

   b) Select the best project using, ERR method. MARR = 18%. E = 12%. [8]

Year	0	1	2	3	4	5
Project A	–40,000	–38,000	+35,000	+35,000	+35,000	+35,000
Project B	–60,000	+25,000	+40,000	–50,000	+50,000	+75,000

   c) Fixed cost = Rs. 60 million, Variable cost/unit = Rs. 50,000, Selling price/unit = Rs. 8,000. Find BEP volume. What would be the effect on profit/loss when S_P increases by 20%. [4]

3. a) How much money should Mr Ram deposit now in a bank so that he and his successor can draw Rs 5000 bimonthly for infinite period? Interest rate is 12 % per year. [6]

   b) Select the best combination of the project where A is independent and B is contingent on C. [10]

Project	A	B	C
Initial Investment	40,000	70,000	50,000
Annual Revenues	15,000	20,000	20000
Annual cost	2,500	3,500	0
Useful life (Yrs.)	8	8	8

The Investment is limited to Rs. 120,000. MARR = 10%.

4. a) Panchakanya has recorded the sales of its products in different years as below. Forecast the sales for year 2020. [8]

Year	2001	2002	2003	2004	2005	2006	2007
Sales (Rs. in Million)	500	550	575	675	650	700	780

b) Write short notes on any two: [2×4]

i) Advantages of Payback Period
ii) Depreciation Methods
iii) Job and Process Costing

5. a) Explain repeatability and cotermination assumptions. [8]

b)

Project	Initial Investment (NRs.)	Annual Revenue (NRs.)	Annual Expenses (NRs.)	Salvage Value	N	MARR
P	5000	3000	2000	1000	8 year	12%
Q	3500	2000	800	350	4 year	12%

Select the best (i) if study period is 10 years (ii) using capitalized worth method. [8]

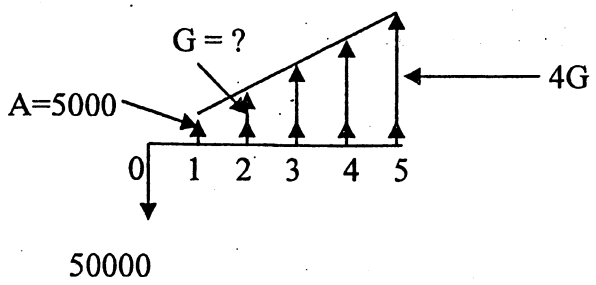
6. a) Explain tax and depreciation or decision tree. [4]

b) A machine costs Rs. 20 million and expect to save Rs. 4 million/year, Tax rate = 50%, MARR = 10%. Evaluate the PW. [4]

c) Perform sensitivity analysis over ±30% is initial cost and useful life. Draw sensitivity diagram and interpret the result for the problem no 1(c). [8]

7. a) Define 'Capital Recovery Cost'. Mr. Fox purchased a motorbike which cost Rs. 2,00,000. He pays 30% as down payment. Remaining amount will be paid on installment basis and wishes to pay Rs. 10,000 per month for 20 months. What annual interest rate is he paying? [2+6]

b) Find the value of G if i = 10% [8]



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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Chaitra

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics

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

1. a) Define economic system. Discuss briefly on the characteristics of capitalistic economy. [2+2]

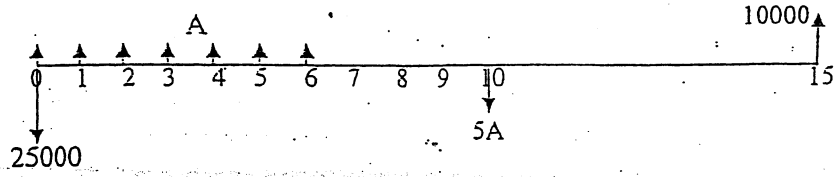
   b) What are the elements of cost? Discuss briefly on the prime cost and overhead costs. [2+2]

   c) The following information has been obtained from the records of a manufacturing company using standard costing system [8]

	Standard	Actual
Production (Unit)	3000	2500
Working days	27	25
Fixed overhead variance	14000	12500
Variable overhead variance	10000	11000

Find all the variances (Including all its components).

2. a) Find the value of A if i = 15% [8]



   b) Mr. X receives a loan of Rs 120,000 from a bank at an interest rate of 12 % per year.

   i) He wishes to repay the loan in monthly installment with Rs. 3000 per month. How many installments are necessary to complete his payment? [4]

   ii) What annual interest rate is he paying if the Bank asks him to pay Rs 5000 per month for 30 times. [4]

3. a) A construction company needs an equipment which costs Rs 10,00,000 and has salvage value of Rs. 1,00,000 at the end of 10 years. The equipment supplier is also willing to provide the equipment on hire for Rs 1,25,000 per year for 10 years. What will you do? Purchase or Hire. MARR = 12% [6]

   b) Find IRR of the following project with initial investment of the Rs 5,00,000 and Salvage value of Rs 1,00,000 at the end of 5 year. The Annual benefit and Operation and Maintenance cost are as following. [10]

End of Year	Benefit	Operation and Maintenance
1	105000	5000
2	115000	10000
3	125000	15000
4	135000	20000
5	145000	25000

Draw unrecovered investment balance diagram also

4. a) From the following four mutually exclusive projects recommend the best one using Payback Period, ERR and BCR methods. The study period is 5 years and MARR = ∈ = 15 %. [16]

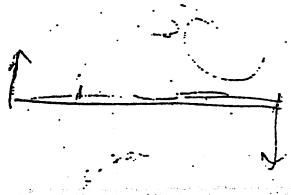
Project	A	B	C	D
Initial investment	500000	400000	700000	600000
Net annual revenue	125000	110000	170000	135000

Salvage Value is 20 % of the initial investment.

5. a) What is breakeven value? Discuss with suitable example. [6]

b) Nepal Airlines is planning to purchase a Jet plane. The estimate on two types of plane under consideration are; [10]

Project	Plane A	Plane B
First investment cost	25,00,00,000	30,00,00,000
Annual O & M	1,50,00,000	1,00,00,000
Useful Life	4 years	6 years
Salvage value	5,00,00,000	6,00,00,000
MARR = 12 %		



Which plane is the best one if it is believed that the plane will be used for i) 4 years and ii) infinite period?

6. a) Define the concept of certainty, Uncertainty and Risk. [4]

b) Perform sensitivity analysis of a following project over a range of ± 30 % in i) Initial investment ii) Net annual cash flow using annual worth formulation. [6]

Initial Cost	Rs. 5,00,000
Annual revenue	Rs. 75,000
Annual maintenance cost	Rs. 10,000
Useful life	10 years
Salvage value	Rs. 50,000
MARR	10%

c) Following data shows the demands for fish when the prices are as shown. Calculate the hypothesized regression equation. What shall be the demand if the price is set to be Rs. 60 per kg? [6]

S.N	Price per kg.	Quantity (tones.)	S.N	Price per Kg.	Quantity (tones).
1	64	65	5	82	51
2	53	75	6	59	65
3	67	56	7	67	63
4	52	69	8	71	55

7. Write short notes on any four [4×4]

a) Job and process costing
b) Drawbacks of IRR
c) Depreciation
d) Factors affecting demand
e) Methods of demand analysis

04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Take MARR = 10% if not specified.*
- ✓ *Draw necessary cash flow diagrams.*
- ✓ *Assume suitable data if necessary.*

1. Select the best project. [16]

	Project A	Project B
Initial investment (Rs.)	3,50,000	5,00,000
Annual revenues (Rs.)	1,90,000	2,50,000
Annual expenses (Rs.)	64,500	1,38,000
Useful life (years)	4	8
Salvage value at the end of useful life	0	0

Use

a) Repeatability assumption
b) Study period is 4 years
c) Infinite project life

2. a) Recommend the best using ERR method $\epsilon = 20\%$ [12]

ERR	Project	End of the cash flows (in Rs. '000)						
		0	1	2	3	4	5	6
28.3%	A	–640	262	290	302	310	310	260
26.4%	B	–680	–40	392	380	380	380	380
28.5%	C	–755	205	406	400	390	390	324

b) Recommend the best using payback period for the problem no. 2(a). [4]

3. a) Explain the mutually exclusive project, independent projects and contingent with suitable examples. [6]

b) Forecast the sales for year 2010. [10]

Year	2000	2001	2002	2003	2004	2005	2006	2007
Sales Rs. '000	416	287	307	268	378	523	457	587

4. a) Calculate variance for the following: [8]

	Standard	Actual
Production units	9,300	10,500
Direct labour hours	102,300	136,500
Fixed overhead (Rs.)	21,483,000	28,392,000
Variable overhead (Rs.)	15,345,000	17,199,000

b) Perform sensitivity analysis over ±30% (varying in increment of 10%) in (i) initial investment (ii) annual net revenue (iii) useful life. Draw sensitivity diagram and interpret the result. [8]

Initial investment = Rs. 20,000
Useful life = 10 years
Revenues/Year = Rs. 6,000
Expenses/Year = Rs. 2,000

5. a) Find the required annual receipts 'A' for the following investment proposal:- [8]

Initial investment = Rs. 10,00,000
Salvage value = Rs. 1,00,000
O & M expenses/year = Rs. 50,000

End of year	1	2	3	4	5
Benefits	A+70,000	A+80,000	A+90,000	A+100,000	A+110,000

b) Find the modified B/C ratio for the problem no. 5(a) [8]

6. a) Explain the economic system. [8]

b) Find IRR and show the unrecovered investment balance in the graphical and tabular form. [8]

Investment (First) Cost = Rs. 2,50,000
Revenues/Year = Rs. 1,00,000
Expneses/Year = Rs. 30,000
Salvage Value = Rs. 50,000
Useful life = 5 years

7. a) Explain the uncertainty and its sources. Differentiate between nominal interest rate and effective interest rate. If monthly interest rate is 1%, what will be the quarterly interest rate? [4+4]

b) Explain tax and depreciation with suitable examples. Find BEP volume for the following project: [4+4]

Fixed cost = Rs. 24 lakh
Selling price = Rs. 800 per unit
Variable cost = Rs. 500 per unit

What would be effect on BEP, when fixed cost increases by 10% and variable decreases by 20%?

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