



MCKV Institute of Engineering

Paper Code: HM-HU501

Economics for Engineers

Time Allotted: 1 Hour

Full Marks: 30

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *five* of the following:

5×1

(i) In NPW method, cash flow is generally calculated on the basis of : (5 × 1 = 5)

- A) Present value
- B) Future Value
- C) Annual value
- D) None of these

(ii) When the interest is given multiple times in a year (say quarterly or monthly) the effective interest rate will be:

- A) Higher than the nominal interest rate
- B) Equal to the nominal interest rate
- C) Lower than the nominal interest rate
- D) None of the options is correct

(iii) A Project can be accepted when the Net Present Worth is found:

- A) Negative
- B) Positive
- C) both of these
- D) None of these

(iv) Internal rate of return is fixed at when NPV value is :

- A) -1
- B) 0
- C) +1
- D) none of above

(v) A person if deposits (P) Rs. 50,000 in a bank at an interest of 10 % compounded annually, then the future value at the end of 5 years will be :

- A) Rs. 80,550
- B) Rs. 70,550
- C) Rs. 85,550

$$F = P(1+P, t, n)$$
$$= 50,000 (1+10, 5)$$

PTO

(1.6105)

D) Rs. 90,550

(vi) The present worth of an alternative is 0. What do you know about the value of the future worth?

- A) FW < 0
- B) FW = 0
- C) FW > 0

Group - B

(Short Answer Type Questions)

Answer any two of the following

2x5

2. In a project being considered, the initial outlay is Rs. 30,00,000; useful life of the project is 10 years; net cash inflow per annum is Rs. 8,00,000; rate of interest is 20%. The salvage value of the plant at the end of 10 years is Rs. 12,00,000. Is the project commercially possible?
547800

3. An equipment is estimated to have 5 years of useful life with no salvage value. Two alternatives are available. They are as follows:-

- (a) Pay Rs. 60,000 immediately and Rs. 15,000 at the end of 1st year
- (b) Make a single payment of Rs. 90,000 at the end of 4th year

If $i = 12\%$ Choose the best alternative. Use PW method.

4. An automobile company recently advertised its car for a down-payment of Rs. 1,35000. Alternatively, the car can be taken home by the customer without any immediate down-payment but he has to pay an equal yearly amount of Rs. 30,000 for 15 years at an interest rate of 15% compounded annually. Draw the cash flow diagram and suggest the better option to the customer.
40472

IX15

Group - C

(Long Answer Type Questions)

Answer any one of the following

5. Compute Net Present Value (NPV) of Project which initially costs Rs. 2,500 and generates year end cash inflows of Rs. 900, Rs. 800, Rs. 700, Rs. 600 and Rs. 500 in 1st year to 5th year respectively. The required rate of return is 10%.
5244.76

6. A man owns a plot and he must decide which of the two mutually exclusive projects he is going to invest based on the return on investment. The details of the projects are as follows:

Costs and other details	Project 1	Project 2
Initial Cost (Rs.)	20,00,000	36,00,000
Annual Property Tax (Rs.)	80,000	1,50,000
Annual Income (Rs.)	8,00,000	9,80,000
Life of the Project	20 yrs.	20 yrs.

Evaluate and recommend which project proposal would be better using future worth method at $i=12\%$

Given $F/A, 12\%, 20 = 72.052$; $F/P, 12\%, 20 = 9.646$



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Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any **five** of the following:

5×1

(i to vi)

- i. Which of the following is not a capital budgeting technique?
 - a. Cost comparison method
 - b. Pay back method
 - c. Net present value method
 - d. Internal Rate of Return method
- ii. IRR is the discount rate at which
 - a. $NPV > 0$
 - b. $NPV < 0$
 - c. $NPV = 0$
 - d. None of these
- iii. MIRR stands for
 - a. Modified Internal Rate of Return
 - b. Modified Interest Rate of Return
 - c. Modified Incremental Rate of Return
 - d. None of these
- iv. What is the P/V factor of $1/(1.22)^9$?
 - a. 0.167
 - b. 0.833
 - c. 0.909
 - d. 0.067

- v. To increase a given present value, the discount rate should be adjusted
 - a. Upward
 - b. Downward
 - c. None of these
 - d. Cannot be determined
- vi. Find the value of, $500(P/A, 9\%, 7)$
 - a. 2514
 - b. 2516
 - c. 1479
 - d. 5555

Group - B

(Short Answer Type Questions)

Answer any *two* of the following

2×5

(2. to 4.)

2. [Module 2/CO2/Analyse-LOCQ] A company is interested to consider a new project which requires an initial investment of Rs.8,00,000. Salvage Value Rs.8000, estimated life of the project is 8 Years. Following are profit after depreciation and tax.

Year	Profit after Tax
1	2,20,000
2	1,50,000
3	2,00,000
4	1,50,000
5	1,75,000

Find out the Pay-back period.

3. [Module 2/CO2/Analyse-LOCQ] Suppose a project costs Rs. 5,000. Its estimated economic life is 2 years. The firm's cost of capital is estimated to be 10%. The estimated cash inflows from the project are Rs. 2,800 p.a. Calculate its NPV.

4. [Module 2/CO2/Understand-LOCQ] Write Accept and Reject Rules of (a) NPV, (b) IRR, (c) PI, (d)ARR, (e)Pay- back period.

Group - C

(Long Answer Type Questions)

Answer any *one* of the following

1×15

(5. to 6.)

5. [Module 1/CO1/Remember-IOCQ] Discuss the Scope of Economic Decision for the Engineers in Economic Decision Making Process.

6. [Module 2/CO2/Apply-HOCQ] A company is considering purchasing one of the following two computers, the details of which are given below. Discount rate is 10%. Calculate NPV & PI. And give conclusion.

Year	Cash flow Computer -A (Rs.)	Cash flow Computer -B (Rs.)
1	10,000	11,000
2	12,000	20,000
3	13,000	4,000
4	9,000	10,000
5	6,000	5,000
Cost of Computer (Initial Investment)	36,000	40,000



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Group - A

Multiple Choice Type Questions)

I. Choose the correct alternatives for any *five* of the following:

5×1

(i to vi)

i) In Replacement analysis, existing machine is known as

- (a) Challenger
- (b) Defender
- (c) both
- (d) None

ii) Which one of the following is false?

- (a) $S-V = F+P$
- (b) $P/V = C/S$
- (c) $C = F+P$
- (d) $S+V = P+F$

iii) The shape of the Capital Recovery cost (CRC) of an asset is normally :

- (a) Decreases with time
- (b) increases with time
- (c) Parallel to the time axis (Horizontal axis)
- (d) Perpendicular to the time axis (Horizontal axis)

(iv) The best method for calculation of depreciation on machinery is considered:

- (a) Straight line (b) Written Down Value (c) Double depreciation (d) none of above

(v) To compute the updated cost of a boiler of the same capacity in a Power plant, we use

- (a) Per unit model (b) Segmenting model (c) Cost index model (d) none of above.

(vi) P/V ratio is calculated by the following formula:

- (a) Per unit sales to per unit variable cost (b) fixed costs to contribution
- (c) Per unit contribution to per unit sale price.

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Group - B
(Short Answer Type Questions)

Answer any *two* of the following

2×5

(2. to 4.)

2. Explain Break Even Point analysis with diagram and state about its limitations.

5

3. The following data are obtained from the records of a factory :-

5

Sales	:	Rs. 2,00,000
Raw material consumed:		Rs. 60,000
Labour charges	:	Rs. 40,000
Variable O/H	:	Rs. 20,000
Fixed O/H	:	Rs. 25,000

Calculate: (a) BEP Sales (b) Sales needed to earn a profit Rs. 50,000.

4. Twenty years ago, when Indian railways started building electric locomotives of 1,000 HP capacity, the cost per locomotive was Rs. 2 million and price index for locomotive inputs was 120. Now price index for inputs has increased to 360. Calculate the present cost of each locomotive.

Group - C
(Long Answer Type Questions)

Answer any *one* of the following

1×15

(5. to 6.)

5. An Electricity Company wants to replace its machinery which was erected in the year 1982 at a cost of Rs. 30,00,000 with a capacity of 300 MW. This consists of material, labour and overhead in the ratio of 5 : 3 : 2. The present cost index of material, labour and overheads are 250, 300 and 240 respectively. The company wants to increase its capacity in order to get the output to 600 MW now. By using cost indexes and power sizing model calculate the projected cost of replacement. Assume power sizing factor to be 0.8.

15

6. A company purchased an equipment for Rs. 1,00,000 with an estimated life of 8 years. The estimated salvage value at the end of its lifetime is Rs. 20,000. Determine the cumulative depreciation charges and the reduced book value of the equipment after 5 years.

5+5+5

- Use: a) Straight line depreciation method.
b) Reducing balance method using 20% rate of depreciation
c) Sum-of-the-years-digits method.

Sample



MCKV Institute of Engineering

Paper Code: Economics for Engineers

Paper Name: HM-HU501

Time Allotted: 3 Hours

Full Marks: 70

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Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any **ten** of the following: $10 \times 1 = 10$

(i) Among the following which is an indirect expenses

- a) Debt Capital b) Sundry Debtors c) Commission d) Wages & Salaries

(ii) Sunk cost is the money spent as a result of

- a) Present decision b) Past decision c) Future Decision d) none

(iii) Inflation makes

- a) future rupees less valuable than present rupees
- b) future rupees more valuable than present rupees
- c) future rupees equal to present rupees
- d) none of these.

(iv) To test the liquidity of a concern which of the following ratio is useful?

- a) Acid Test Ratio b) Capital Turnover Ratio
- c) Bad debt-sales Ratio d) Inventory Turnover Ratio

$$\textcircled{O} = \frac{\text{O} - S}{n}$$

(v) The opportunity cost of a good is

- a) the time last in finding it
- b) the quantity of other goods sacrificed to the another unit of that good
- c) the expenditure on the good
- d) the loss of interest in using saving

(vi) The break-even point is where

a) total sales equals total variable costs

b) contribution margin equals total fixed costs

c) total variable costs equal total fixed costs

d) total sales equals total fixed costs

(vii) Which of the following statements about IRR and NPV is not correct?

a) NPV always gives the correct investment decision.

b) IRR gives an unreliable answer with non-conventional projects.

c) IRR can accommodate changes in the cost of capital.

d) IRR is a useful relative measure if comparing projects of differing sizes

(viii) Depreciation is charged on the original cost of the asset in

a) Fixed Installment method

b) Reducing Balance Method

c) Sinking-fund method

d) SOYD method

(ix) Tax is deducted from

a) PBIT

b) operating profit

c) PBT

d) none

(x) A person if deposits Rs. 50,000 in a bank at an interest of 10 % compounded

annually, then the future value at the end of 5 years will be :

a) 80,525 b) 70,525 c) 85,525 d) 90,525

(xi) If fixed cost is Rs.10,000 and P/V ratio is 50%, the break-even point will be

a) Rs.30,000 b) Rs.40,000 c) Rs.20,000 d) Rs.50,000

(xii) Marginal Revenue is calculated on the basis of

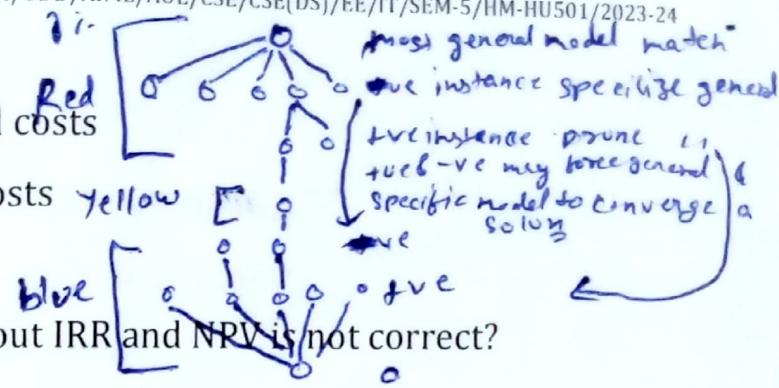
a) Revenue on per unit basis

b) rate of change of total revenue

c) Rate of change of cost

d) Average revenue

Specialization is colored red
Generalization is colored blue.
Diagonal version space



$$ANN = \sum_{i=1}^n w_i * x_{i+1}$$

Group - B

(Short Answer Type Questions)

Answer any **three** of the following

2. The following figures are available of a project:-

<u>YEAR</u>	<u>SALES</u> in Rs.	<u>Profit</u> in Rs.
2012	3,00,000	25,000
2011	2,00,000	10,000

67275.1

Calculate (a)P/V Ratio (b)Fixed Cost (c)Margin of Safety

[Module 2/CO2/Analyse-IOCQ]

5

3. A bank gives loan to a company to purchase an equipment which is worth Rs.5,00,000 at an interest rate of 18% compounded annually. This amount should be repaid in 25 yearly equal instalments. Find the instalment amount that the company has to pay to the bank. marks

[Module 2/CO2/Apply-IOCQ]

5

4. "Capital Budgeting is long-term for planning for making and financing proposed capital outlays" - Explain. [Module 2/CO2/Analyse-HOCQ] 5

5. Establish an income statement out of the following data of Tata Sons Ltd for the year ended 30th June 2013 Sales=Rs.1,00,000 Cost of goods sold=Rs.28,000 Operating Expenses=Rs.12,000 Non-operating Expenses=Rs.4500 Interest=Rs.1000 Tax Rate=40% [Module 4/CO4/Evaluate-IOCQ] 5

6. A company has to replace an asset after 10 years at an outlay of Rs. 5 lakhs it plans to deposit an equal amount at the end of every year for next year at an annually compounded interest of 20% Find the equivalent amount to be deposited at the end of every year for the next 10 years. [Module 2/CO2/Evaluate-IOCQ] 5

Group - C

(Long Answer Type Questions)

Answer any **three** of the following

$3 \times 15 = 45$

7. Your company has an opportunity to invest in a project that is expected to result in after-tax cash flows of rs.18,000 the first year, Rs.20,000 the second year, Rs.23,000 the third year, -Rs.8,000 the fourth year, Rs.30,000 the fifth year, Rs.36,000 the sixth

$$FV = P \times \frac{(1+\gamma)^n - 1}{\gamma} = P = \frac{FV \times \gamma}{(1+\gamma)^n - 1}$$

1.92

1.68

1.48

6.3

1.33

year, Rs.39,000 the seventh year, and -Rs.6,000 the eighth year. The project would cost the firm Rs.142,000. If the firm's cost of capital is 12%, what is the modified internal rate of return for the project? [Module 3/CO2/Evaluate-IOCQ] 15

(8) i) How would you explain the various methods of depreciation? ii) Two equipments are purchased each for Rs.12,000/- . The estimated useful life is 5 years for both the estimated scrap value for each equipment is RS.2,000/- . For one equipment the straight line method is used to calculate annual depreciation and for the other equipment, the reducing balance method is adopted. Compare the depreciation charges for both for all the 5years. [Module 4/CO3/Apply-IOCQ] 15

9. What do you mean by Decision tree analysis? Explain the situation under which this technique is useful? [Module 3/CO3/Understand-IOCQ] 6+9

10. Write short note on any **three**:

1.81

2.19

 $5 \times 3 = 15$

- a) Open market operation
 - b) Sources of Project Finance
 - c) Per unit model
 - d) Index numbers
 - e) Sensitivity Analysis
- [Module 3/CO2/Analyse-IOCQ]

Dr. 1.50
- 448,106,44

11. a) Establish the relationship between market interest rate ,real interest rate and Inflation rate.

b) YEAR: 0 1 2 3 4 5
Cash flow: 1000000 100000 200000 300000 600000 300000

- i) What is the NPV of the project if the discount rate is 14% for the entire period?
- ii) What is the NPV of the project if the discount rate is 12% for year 1 and rises every year by 1%? [Module 3/CO2/Analyse-IOCQ] 7+8

$$1 + r_{\text{eff}} R = (1 + r_I R) * (1 + I R)$$

$$\text{NPV} = \sum \frac{\text{cash flow}_{t+1}}{(1 + \text{Discount})^t}$$



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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any **ten** of the following: $10 \times 1 = 10$
- Cost reflected in accounting system only is called
 - a) Cash cost
 - b) Overhead cost
 - c) Book cost
 - d) Direct cost
 - The shape of the Capital Recovery cost (CRC) of an asset is normally :
 - a) Decreases with time
 - b) Parallel to the time axis (Horizontal axis)
 - c) Increases with time
 - d) Perpendicular to the time axis (Horizontal axis)
 - Which can be regarded as the primary books of accounts?
 - a) Annual books of Accounts
 - b) Ledger Folio
 - c) Journal
 - d) None
 - The index which measures prices of a selection of goods and services purchased by a given consumer class is
 - a) Consumer Price Index
 - b) Commodity Price Index
 - c) Composite Price Index
 - d) Producer Price Index
 - To compute the updated cost of a boiler of the same capacity in a Power plant, we use
 - a) Per unit model
 - b) Segmenting model
 - c) Cost index mode
 - d) none of above.
 - A person if deposits Rs. 50,000 in a bank at an interest of 10 % compounded annually, then the future value at the end of 5 years will be : *50,000 (F/P, 10%, 5)*
 - a) 80,525
 - b) 70,525
 - c) 85,525
 - d) 90,525
 - A person if deposits Rs. 50,000 in a bank at an interest of 10 % compounded annually, then the future value at the end of 5 years will be :
 - a) 80,525
 - b) 70,525
 - c) 85,525
 - d) 90,525

viii) P/V ratio is calculated by the following formula:

- a) Per unit sales to per unit variable cost
 - b) Fixed costs to contribution
 - c) Per unit contribution to per unit sale price ✓
 - d) None
- ix) To test the liquidity of a concern which of the following ratio is useful?
- a) Acid Test Ratio ✓
 - b) Capital Turnover Ratio
 - c) Net profit margin
 - d) Inventory Turnover Ratio.
- x) Which of the following is a current liability?
- a) Inventory
 - b) Plant and machinery
 - c) Outstanding salary
 - d) None of above
- xi) Direct costs of a product is:
- a) The costs related to the direct labour and raw material only
 - b) The costs related to the salary, depreciation and taxes only
 - c) The costs related to the direct labour and Fixed assets
 - d) The costs related to raw materials, wages and all direct expenses.
- xii) Internal rate of return is calculated when NPV value is:
- a) -1
 - b) 0
 - c) +1 ✓
 - d) None of above

Group - B

(Short Answer Type Questions)

Answer any **three** of the following

$3 \times 5 = 15$

✓ 2. A company received two options for purchasing a copier machine for its office. It can make a down-payment of Rs. 30,000 and take delivery of the copier machine. The remaining money is to be paid in 24 equal monthly installments of Rs. 4,500 each. Alternatively the company $73,629.7 \& 9,70,660$ option 2. can take the delivery of the machine by making a full payment of Rs.1,00,000. Assume the interest rate is 9 % compounded annually. Suggest the better option to the company. Given that [$P/A, 3/4\%, 24 = 21.8893$]. (5)

✓ 3. An equipment is estimated to have 5 years of useful life with no salvage value. Two alternatives are available. They are as follows:- $73,33,935$ Alternative 1
 a) Pay Rs. 60,000 immediately and Rs. 15,000 at the end of one year
 b) Make a single payment of Rs. 90,000 at the end of 4th year
 If $i=12\%$ Choose the best alternative. $57,195$. (P-1) (5)

✓ 4. Consider the given data to compute depreciation schedule using the following methods:
 i) Straight line method ii) Sum of the year digit Method (SOYD)

Cost of the Asset Rs. 10,00,000; life of the asset 5 years and Salvage Value Rs. 1,00,000.

18000 Same Depreciation. *300,000 10,00,000 (5)*

5. Draw a break-even chart and explain its components.

2,40,000 2,00,000 (5)

6. a) Define the difference between a "cash cost" and a "book cost." Is engineering economic analysis concerned with both types of cost? Give an example of each. (3)

b) Define the concept of "learning curve".

1,20,000 4,60,000 (2)

Group - C

(Long Answer Type Questions)

Answer any **three** of the following

3×15=45

7. a) A company is trying to diversify its business in a new product line. The life of the project is 10 years with no salvage value at the end of its life. The initial outlay of the project is Rs. 20,00,000. The annual net profit is Rs. 3,50,000. Find the rate of return for the new business. (Draw a cash flow diagram). *11.91%* (7)

b) Discuss the difference in evaluating alternatives of private and public organizations.

Q (4+4)

8. A firm has an investment proposal, requiring an outlay of Rs. 1,60,000. The investment proposal is expected to have two years of economic life with no salvage value. The probability assigned to cash inflow after tax for the 2 years are as follows:

Year	Cash Flow & Probability(p)	Cash Flow & Probability(p)
1st	Rs. 1,00,000 (p)=0.4	Rs. 1,20,000 (p)=0.6
2nd	Rs. 48,000 (p)=0.2	Rs. 80,000 (p)=0.4
	Rs. 64,000 (p)=0.3	Rs. 1,00,000 (p)=0.5
	Rs. 88,000 (p)=0.5	Rs. 1,20,000 (p)=0.1

The firm uses 10% discount rate for this type of investment. You are required to find out the followings:

a) Construct a decision tree for the proposed investment project and calculate the E (NPV).

b) What NPV will the project yield, if worst outcome is realized and the probability of the occurrence?

c) What will be the worst outcome and the probability of the occurrence?

d) Will the project be accepted? (7+3+3+2)

9. a) State some reasons for replacement of existing assets. What do you mean by Capital Recovery Cost. (3+2)

b) Two years ago, a machine was purchased at a cost of Rs. 2,00,000 to be useful for eight years. Its salvage value at the end of its life is Rs. 25,000. The annual maintenance cost is Rs. 25,000. The market value of the present machine is Rs. 1,20,000. Now, a new

machine to cater to the need of the present machine is available at Rs. 1,50,000 to be useful for six years. Its annual maintenance cost is Rs. 14,000. The salvage value of the new machine is Rs. 20,000. Using an interest rate of 12%, find whether it is worth replacing the present machine with the new machine.

*162560.5
No, 1,53,549.6*

(10)

10. a) Discuss different types of cost indices used in cost estimation. (10)
 b) Based on a power-sizing model, Miriam has been asked to estimate the cost today of a 2500-ft² heat exchange system for the new plant being analyzed.

She has the following data.

- Her company paid Rs. 50,000 for a 1000-ft² heat exchanger 5 years ago.
- Heat exchangers within this range of capacity have a power-sizing exponent (x) of 0.55.
- Five years ago, the Heat Exchanger Cost Index was 1306; it is 1487 today. (5)

11. Write short notes on **any three** of the following: - (3×5)

- a) Profitability index method.
- b) Methods of depreciation calculation
- c) Economic Decision Tree.
- x d) Life cycle costing
- e) Cost Accounting

(3)