Reg. No.:

**Question Paper Code: 11556**


Eighth Semester

Mechanical Engineering

MG 2451/MG 81/GE 1451/080120038 — ENGINEERING ECONOMICS AND COST ANALYSIS

(Common to Production Engineering)

(Regulation 2008)


Time: Three hours

Maximum: 100 marks

Use of interest tables is permitted.

Answer ALL questions.

**PART A** — (10 × 2 = 20 marks)

1. Illustrate the effect of price on demand and supply; illustrate with the help of a diagram.

2. What are the ways by which the economic efficiency can be improved?

3. Define value analysis (VA)/value engineering (VE).

4. How long will it take any sum to triple itself at 5 percent simple-interest rate?

5. Draw a neat sketch of present worth function graph.

6. Write short notes on rate of return method.

7. Distinguish between breakdown maintenance and preventive maintenance.

8. Write short notes on reasons for replacement.

9. Define the following: Depreciation and book value.

PART B — (5 × 16 = 80 marks)

11. (a) Krishna Company Ltd. have the following details:
Fixed cost = Rs. 40,00,000
Variable cost per unit = Rs. 300
Selling price per unit = Rs. 500

Find
(i) The break-even sales quantity
(ii) The break-even sales
(iii) If the actual production quantity is 1,20,000, find the following:
(1) Contribution
(2) Margin of safety by all methods.

Or
(b) (i) Define break-even point. Draw a break-even chart and explain its components. (8)
(ii) Discuss the factors which influence demand and supply. (8)

12. (a) (i) Discuss the symptoms favoring the application of VA/VE. (6)
(ii) A person is planning for his retired life. He has 10 more years of service. He would like to deposit 20% of his salary, which is Rs. 4,000, at the end of the first year, and thereafter he wishes to deposit the amount with an annual increase of Rs. 500 for the next 9 years with an interest rate of 15%. Find the total amount at the end of the 10th year of the above series. (10)

Or
(b) (i) A company has to replace a present facility after 15 years at an outlay of Rs. 5,00,000. It plans to deposit an equal amount at the end of every year for the next 15 years at an interest rate of 18% compounded annually. Find the equivalent amount that must be deposited at the end of every year for the next 15 years. (10)
(ii) Discuss the advantages and application areas of values engineering. (6)

13. (a) A company must decide whether to buy machine A or machine B:

<table>
<thead>
<tr>
<th></th>
<th>Machine A</th>
<th>Machine B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial cost</td>
<td>Rs. 4,00,000</td>
<td>Rs. 8,00,000</td>
</tr>
<tr>
<td>Useful life, in years</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Salvage value at the end of machine life</td>
<td>Rs. 2,00,000</td>
<td>Rs. 5,50,000</td>
</tr>
<tr>
<td>Annual maintenance cost</td>
<td>Rs. 40,000</td>
<td>0</td>
</tr>
</tbody>
</table>

At 12% interest rate, which machine should he selected? (Use future worth method of comparison).

Or

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(b) A transport company has been looking for a new tyre for its truck and has located the following alternatives:

<table>
<thead>
<tr>
<th>Brand</th>
<th>Tyre Warranty (month)</th>
<th>Price per Tyre (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12</td>
<td>1,200</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>1,800</td>
</tr>
<tr>
<td>C</td>
<td>36</td>
<td>2,100</td>
</tr>
<tr>
<td>D</td>
<td>48</td>
<td>2,700</td>
</tr>
</tbody>
</table>

If the company feels that the warranty period is a good estimate of the tyre life and that a nominal interest rate (compounded annually) of 12% is appropriate, which tyre should it buy?

14. (a) A diesel engine was installed 10 years ago at a cost of Rs. 50,000. It has a present realizable market value of Rs. 15,000. If kept, it can be expected to last five years more, with operating and maintenance cost of Rs. 14,000 per year and to have a salvage value of Rs. 8,000 at the end of the fifth year. This engine can be replaced with an improved version costing Rs. 65,000, which has an expected life of 20 years. This improved version will have an estimated annual operating and maintenance cost of Rs. 9,000 and ultimate salvage value of Rs. 13,000. Using an interest rate of 15%, make an annual equivalent cost analysis to determine whether to keep or replace the old engine.

Or

(b) An electronic equipment contains 1,000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs. 10. If all the resistors are replaced at the same time, the cost per resistor is Rs. 4. The per cent surviving, S(i) at the end of month i is tabulated as follows:

<table>
<thead>
<tr>
<th>i</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>S(i)</td>
<td>100</td>
<td>96</td>
<td>89</td>
<td>68</td>
<td>37</td>
<td>13</td>
<td>0</td>
</tr>
</tbody>
</table>

Which is the optimum replacement plan?

15. (a) (i) A company has purchased an equipment whose first cost is Rs. 1,00,000 with an estimated life of eight years. The estimated salvage value of the equipment at the end of its lifetime is Rs. 20,000. Determine the depreciation charge and book value at the end of various years using the straight-line method of depreciation.

(ii) A company has purchased a bus for its officers for Rs. 10,00,000. The expected life of the bus is eight years. The salvage value of the bus at the end of its life is Rs. 1,50,000. Find the following using the sinking fund method of depreciation:

(1) Depreciation at the end of the third and fifth year
(2) Book value at the end of the second year and sixth year.

Or
(b) (i) An automobile company has purchased a wheel alignment device for Rs. 10,00,000. The device can be used for 15 years. The salvage value at the end of the life of the device is 10% of the purchase value. Find the following using the double declining balance method of depreciation:

(1) Depreciation at the end of the seventh year
(2) Depreciation at the end of the twelfth year
(3) Book value at the end of the eighth year

(ii) The first coat of a road laying machine is Rs. 80,00,000. Its salvage value after five years is Rs. 50,000. The length of road that can be laid by the machine during its lifetime is 75,000 km. In its third year of operation, the length of road laid is 2,000 km. Find the depreciation of the equipment for that year.