

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
(END SEMESTER EXAMINATION MO/2022)

CLASS: B.TECH.  
BRANCH: ALL

SEMESTER: 7<sup>th</sup>  
SESSION: MO/2022

SUBJECT: PE211 ENGINEERING ECONOMY

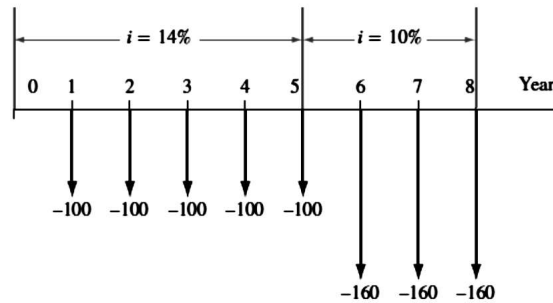
TIME: 03 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates.

- Q.1 (a) Derive the formula for finding the uniform-gradient-series factor ( $A/G, i, n$ ). [5] CO1 BL3  
 Q.1 (b) Find the F, P, and A values for the negative cash flows shown in the diagram. [5] CO1 BL4



- Q.2 (a) What is the difference between mutually exclusive and independent projects? [2] CO2 BL2  
 Q.2 (b) The cost of grading and spreading gravel on a short rural road is expected to be \$300,000. The road will have to be maintained at the cost of \$25,000 per year. Even though the new road is not very smooth, it allows access to an area that previously could only be reached with off-road vehicles. The improved accessibility has led to a 150% increase in property values along the road. If the previous market value of a property was \$900,000, calculate the B/C ratio using an interest rate of 10% per year and a 20-year study period. [3] CO2 BL4
- Q.2 (c) Nissan's all-electric car, the Leaf, has a base price of \$32,780 in the United States, but it is eligible for a \$7500 federal tax credit. A consulting engineering company wants to evaluate the purchase or lease of one of the vehicles for use by its employees traveling to job sites in the local area. The cost for leasing the vehicle will be \$4200 per year (payable at the end of each year) after an initialization charge of \$2500 paid now. If the company purchases the vehicle, it will also purchase a home charging station for \$2200 which will partially offset a 50% tax credit. If the company expects to be able to sell the car and charging station for 40% of the base price of the car alone at the end of 3 years, should the company purchase or lease the car? Use an interest rate of 10% per year and an annual worth analysis. [5] CO2 BL4
- Q.3 (a) Find the depreciation annuity by the annuity charging method after three years, when the cost of the machine is Rs. 8000 and the scrap value is Rs. 4000. Rate of interest is 10%. [2] CO3 BL4  
 Q.3 (b) Machine A operated manually, costs Rs. 2000 and has a life of 2 years. While an automatic machine B costs Rs. 3000 but has a life of 4 years. The operating cost for machine A is Rs.4000 per year, while that of machine B is Rs. 3000 only. Which of the machines should be purchased? Consider 10% interest. [3] CO3 BL4  
 Q.3 (c) A firm is considering the replacement of equipment, whose first cost is Rs. 4,000, and the scrap value is negligible at the end of any year. Based on experience, it was found that the maintenance cost is zero during the first year, and it increases by Rs. 200 every year thereafter. When should the equipment be replaced if  $i = 0\%$ ? [5] CO3 BL4
- Q.4 (a) Briefly explain the opportunity cost with a suitable example. [2] CO4 BL2

PTO

- Q.4 (b) Find the factory cost of an article made from a solid brass bar 38 mm in diameter and 25 mm in length. The machining time taken to finish the part is 90 minutes, and the labor rate is Rs. 5.00 per hour. Factor overheads are 40 percent of direct labor costs. The density of the material is 8.6 gms per cub-cm, and its cost is Rs. 4.50 per newton. [3] CO4 BL4
- Q.4 (c) The catalog price of the drilling machine is Rs. 6000, and the discount allowed to the distributor is 20 percent. The administrative and selling expenses are 50 percent of the factory cost, and the material cost, labor cost, and factory overheads are in the ratio of 1:3:2. If the cost of labor on the manufacture of the machine is Rs. 1200, determine the profit on each machine. [5] CO4 BL4
- Q.5 (a) The following details are available: [4] CO5 BL4
- |           | Sales<br>Rs. | Profit<br>Rs. |
|-----------|--------------|---------------|
| Period I  | 2,00,000     | 20,000        |
| Period II | 3,00,000     | 40,000        |
- Find out break-even sales and P/V ratio.
- Q.5 (b) A factory producing only one item, which it sells for Rs. 12.50 per unit, has a fixed cost equal to Rs. 60,000 and a variable cost of Rs. 7.50 per unit. [6] CO5 BL4
- Find out:
- i) The number of units to be produced to break even.
  - ii) Number of units to be produced to earn a profit of Rs. 12,000.
  - iii) The profit if 25,000 units are produced and sold.

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