

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

**CLASS: B. TECH.  
BRANCH: BT/CHEMICAL/CIVIL/CSE/ECE/MECH**

**SEMESTER: VII  
SESSION: MO/2023**

**SUBJECT: PE211 ENGINEERING ECONOMY**

**TIME: 3 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. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- |  |     | CO | BL |
|--|-----|----|----|
| Q.1(a) What is continuous compounding? Explain with suitable example.  | [2] | 1  | 2  |
| Q.1(b) How much will be in a high-yield account at the National Bank of Arizona 12 years from now if you deposit \$5000 now and \$7000 five years from now? The account earns interest at a rate of 8% per year, compounded quarterly.   | [3] | 1  | 3  |
| Q.1(c) Two engineering graduates who recently got married are planning for their early retirement 20 years from now. They believe that they will need \$2,000,000 in year 20. Their plan is to live on one of their salaries and invest in the other. They already have \$25,000 in their investment account.<br>a) How much will they have to invest each year if the account grows at a rate of 10% per year?<br>b) If the maximum they have available to invest each year is \$40,000, will they reach their goal of \$2 million by year 20?  | [5] | 1  | 3  |
| Q.2(a) Suppose a decision maker had the following 15 proposals to consider:<br>A1     A2     A3     A4     A5     A6<br>B1     B2     B3<br>C1     C2     C3     C4<br>D1     D2<br>where the proposals in each row are mutually exclusive and the set of proposals in each row is independent from any other set or row of proposals. What is the maximum number of mutually exclusive alternatives that can be obtained from the group of proposals in the given case?   | [2] | 2  | 3  |
| Q.2(b) As part of the rehabilitation of the downtown area of a southern U.S. city, the Parks and Recreation Department expects to develop the space below several overpasses into basketball, handball, miniature golf, and tennis courts. The estimates are initial cost of \$190,000, life of 20 years, and annual M&O costs of \$21,000. The department expects 20,000 people per year to use the facilities an average of 2 hours each. The value of the recreation has been conservatively set at \$1.00 per hour. At a discount rate of 10% per year, what is the B/C ratio for the project?   | [3] | 2  | 3  |
| Q.2(c) Accurate airflow measurement requires straight unobstructed pipe for a minimum of 10 diameters upstream and 5 diameters downstream of the measuring device. In a field application, physical constraints compromise the pipe layout, so the engineer is considering installing the airflow probes in an elbow, knowing that flow measurement will be less accurate but good enough for process control. This is plan 1, which will be in place for only 3 years, after which a more accurate flow measurement system with the same costs as plan 1 will be available. This plan will have a first cost of \$26,000 with an annual maintenance cost estimated at \$5000.<br>Plan 2 involves installation of a recently designed submersible airflow probe. The stainless-steel probe can be installed in a drop pipe with the transmitter located in a waterproof enclosure on the handrail. The first cost of this system is \$83,000, but because it is accurate and more durable, it will not have to be replaced for at least 6 years. Its maintenance cost is estimated to be \$1400 per year plus \$2500 in year 3 for replacement of signal processing software. Neither system will have a salvage value. At an interest rate of 10% per year, which one should be selected based on a present worth comparison? | [5] | 2  | 3  |

- |        |   |     |   |   |
|--------|---|-----|---|---|
| Q.3(a) | Briefly discuss the various factors affecting the periodic allocation of depreciation.  | [2] | 3 | 1 |
| Q.3(b) | Find out the depreciation annuity by the annuity charging method after 3 years, when the cost of machine is Rs. 8,000 and the scrap value is Rs. 4,000 only. Rate of interest is 5 percent. Also calculate the value of the machine after 2 years.  | [3] | 3 | 3 |
| Q.3(c) | To improve package tracking at a UPS transfer facility, conveyor equipment was upgraded with RFID sensors at a cost of \$345,000. The operating cost is expected to be \$148,000 per year for the first 3 years and \$210,000 for the next 3 years. The salvage value of the equipment is expected to be \$140,000 for the first 3 years, but due to obsolescence, it won't have a significant value after that. At an interest rate of 10% per year, determine the economic service life of the equipment and associated annual worth.   | [5] | 3 | 3 |
| Q.4(a) | Differentiate between marginal and incremental costs with suitable example.   | [2] | 4 | 2 |
| Q.4(b) | Find the factory cost of an article made from solid brass bar 38 mm diameter and 25 mm 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 cost. The density of the material is 8.6 gms per cub-cm and its cost is Rs. 4.50 per newton.  | [3] | 4 | 3 |
| Q.4(c) | An asset that was purchased 3 years ago for \$100,000 is becoming obsolete faster than expected. The company thought the assets would last 5 years and that its book value would decrease by \$20,000 each year and, therefore, be worthless at the end of year 5. In considering a more versatile, more reliable high-tech replacement, the company discovered that the presently owned asset has a market value of only \$15,000. If the replacement is purchased immediately at a first cost of \$75,000 and if it will have a lower annual worth, what is the amount of the sunk cost? Assume the company's MARR is 10% per year. | [5] | 4 | 3 |
| Q.5(a) | Describe the effect of increase or decrease in fixed costs and variable costs on B.E.P, with the help of neat sketches.   | [2] | 5 | 2 |
| Q.5(b) | An engine lathe costing ₹ 10,000 can produce components at the rate of 6 pieces per hour and another automatic lathe costing ₹ 20,000 can produce 20 pieces per hour. The operator on either of the machine is to be paid at the rate of ₹ 1.50 per hour. Determine the minimum number of pieces which will change the cost situation in favor of the automatic lathe.  | [3] | 5 | 3 |
| Q.5(c) | The fixed costs for the year 2019-20 are ₹ 5,00,000, variable cost per unit is ₹ 25. The estimated sales for the period are valued at ₹ 15,00,000. Each unit sells at ₹ 150. Determine:<br>a) Break-even point.<br>b) ₹ 12,00,000 will be the likely sales turnover for the next budget period, calculate the estimated contribution and profit.<br>c) If a profit target of ₹ 6,50,000 has been budgeted, compute the turnover required.   | [5] | 5 | 3 |

:29/11/2023 M: