BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: **B.TECH** **SEMESTER: VII**
BRANCH: **CHEMICAL ENGINEERING** **SESSION: MO/2023**

SUBJECT: CL404 PROJECT ENGINEERING AND ECONOMICS

TIME: **02 HOURS** **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 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**

			CO	BL
Q.1(a)	Write the name of various types of capital cost estimates.	[2]	CO1	BL1
Q.1(b)	Discuss the design constraints with a neat diagram.	[3]	CO1	BL2
Q.1(c)	The annual variable production costs for a plant operating at 70 percent capacity are $280,000. The sum of the annual fixed charges, overhead costs, and general expenses is $200,000, and may be considered not to change with production rate. The total annual sales are $560,000, and the product sells for $4/kg. Calculate the breakeven point in kilograms of product per year? What is the gross annual profit Gj (depreciation included) and net annual profit for this plant at 100 percent capacity if the income tax rate is 35 percent of gross profit?	[5]	CO1	BL3
Q.2(a)	For the case of a nominal annual interest rate of 20 percent per year, determine effective annual interest rate compounded continuously.	[2]	CO2	BL3
Q.2(b)	A reactor, which will contain corrosive liquids, has been designed. If the reactor is made of mild steel, the initial installed cost will be $10000, and the useful-life period will be 3 years. Since stainless steel is highly resistant to the corrosive action of the liquids, stainless steel, as the material of construction, has been proposed as an alternative to mild steel. The stainless-steel reactor would have an initial installed cost of $20,000. The scrap value at the end of the useful life would be zero for either type of reactor, and both could be replaced at a cost equal to the original price. Based on equal capitalized costs for both types of reactors, what should be the useful-life period for the stainless-steel reactor if money is worth 6 percent compounded annually?	[3]	CO2	BL3
Q.2(c)	A loan of $1000 at a nominal interest rate of 20 percent per year is made for a repayment period of 3 years. Determine the constant payment per period, the interest and principal paid each period, and the remaining unpaid principal at the end of each period by using constant end-of-the-year payments.	[5]	CO2	BL3
Q.3(a)	Define salvage and book value of an item.	[2]	CO3	BL1
Q.3(b)	The original value of a piece of equipment is $22,000, completely installed, and ready for use. Its salvage value is estimated to be $2000 at the end of a service life estimated to be 10 years. Determine the asset (or book) value of the equipment at the end of 5 years using Double declining-balance method.	[3]	CO3	BL3

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