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

CLASS: B. TECH / BARCH **SEMESTER: IV**
BRANCH: CIVIL/CHEMICAL/CSE/EEE/ECE/IT/MECH/ARCH **SESSION: SP/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.

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Q.1(a)	Briefly discuss the relationship between the effective rate of interest and the nominal rate of interest with a suitable example.	[2]	1	2
Q.1(b)	In 2011, El Paso Water Utilities (EPWU) issued bonds worth $9.125 million to improve the Van Buren dam in central El Paso and to finance three other drainage projects. The bonds were purchased by the Texas Water Development Board under the federal stimulus program, wherein EPWU did not have to pay any dividend on the bonds. If the bond dividend rate would have been 4% per year, payable quarterly, with a bond maturity date 18 years after issuance, what is the present worth of the dividend savings to EPWU rate payers? Assume the market interest rate is 6% per year.	[3]	1	3
Q.1(c)	China spends an estimated $100,000 per year on cloud seeding efforts, which include using antiaircraft guns and rocket launchers to fill the sky with silver iodide. In the United States, utilities that run hydroelectric dams are among the most active cloud seeders, because they believe it is a cost-effective way to increase limited water supplies by 10% or more. If the yields of cash crops will increase by 4% each year for the next three years because of extra irrigation water captured behind dams during cloud seeding, what is the maximum amount the farmers should spend now on the cloud seeding activity? The value of the cash crops without the extra irrigation water would be $600,000 per year. Use an interest rate of 10% per year.	[5]	1	3
Q.2(a)	The cost of maintaining a certain permanent monument in Washington, DC, occurs as periodic outlays of $1000 every year and $5000 every 4 years. Calculate the capitalized cost of the maintenance using an interest rate of 10% per year.	[2]	2	3
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 a 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 6% per year and a 20-year study period.	[3]	2	3
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 that will be partially offset by 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 annual worth analysis.	[5]	2	3
Q.3(a)	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

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Q.3(b)	Discuss the relationship between SLM, DBM, and SYDM methods of depreciation with a suitable example.	[5]	3	2
Q.4(a)	Two technicians are engaged in milling machines for 30 jobs, each weighing 6 kg in a shift of 8 hours. They are paid at the rate of Rs 150 and Rs 120 per day. The material costs Rs 5.0 per kg. If the factory and administrative costs are twice the labor cost, find the cost of production per unit.	[2]	4	3
Q.4(b)	Differentiate between marginal and incremental costs with a suitable example.	[3]	4	2
Q.4(c)	The variable overhead charges for a product are ₹ 2, and fixed overhead charges per month are ₹ 35,100. It is found that 65,000 products are manufactured per month under normal conditions. a) Find the normal overhead cost per product. b) If the production drops to 90%, determine the overhead charges that are unrecovered. c) If the production is increased to 130% by what amount these charges will be over recovered.	[5]	4	3
Q.5(a)	A plant is manufacturing 3000 heavy duty lathes per year and is operating at 75% of its capacity. The annual sales return is ₹ 1,05,00,000. The fixed cost of the plant is ₹ 40,00,000 and variable cost ₹ 4,150.00 per unit. There is a proposal to utilize spare capacity by manufacturing precision lathes which would increase the fixed cost by ₹ 8,00,000 but reduce the variable cost by ₹ 750 per unit. i) Is the proposal economical? Given reasons for answer. ii) ii) If reduction in selling price by ₹ 500 per unit requires the plant to be run at 90% of its capacity to break-even, would this be a better proposal than the earlier one?	[5]	5	3
Q.5(b)	The fixed costs for the financial year 2011-12 are ₹ 40,000. The sales for this period are ₹1,00,000. The variable cost per unit is ₹ 2. The selling price of each product is ₹ 10, and the number of units involved coincides with the expected volume of output. Construct the Break-even chart and determine: i) Break-even point. ii) How many minimum products should be sold to earn profit? iii) Profit earned at a turnover of ₹ 80,000. iv) Margin of safety. v) Angle of incidence.	[5]	5	3

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