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

CLASS: BE **SEMESTER : VI**
BRANCH: ALL **SESSION : SP/18**

SUBJECT: PE6009 ENGINEERING ECONOMY

TIME: 3. Hours **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
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.

Q.1(a) Explain the accounting convention of conservatism with example. [2]

Q.1(b) Journalize the following transactions in the books of Rahul for June 2017: [4]
June 1: Rahul started business with Rs. 10,00,000/- of which 25% amount was borrowed from wife Pihu.
June 4: Purchased goods from Aniket worth Rs. 40,000/- at 20% trade discount and 1/5th amount paid in cash.
June 10: Sold goods to Vishakha Rs. 30,000/- and received 30% amount in cash.
June 22: Paid to Aniket Rs. 25,500/- in full settlement of A/c.

Q.1(c) From the following particulars prepare a balance sheet of M/s. Banerjee & Sons for the year ended 31st March 2018 (all transactions are in Rupees). [6]
Owner's capital: 5,00,000/-; Owner's drawing: 70,000/-; Net Profit for the year: 7,40,000/-; Sundry creditors: 4,00,000/-; Furniture: 4,00,000/-; Machinery: 3,00,000/-; Loose tools: 1,00,000/-; Sundry debtors: 2,00,000/-; Bills receivables: 50,000/-; Cash in hand: 45,000/-; Cash at bank: 2,00,000/-; Petty cash: 5,000/-;
Adjustments: (i) Stock on 31st March was valued at Cost price: 4,20,000/- and market price: 4,00,000/-. (ii) Depreciate furniture @ 10% p.a. and machinery @ 20% p.a. (iii) Rent of 5,000/- was paid in advance. (iv) Salaries & wages due but not paid: 30,000/-. (v) Make a provision for doubtful debts @ 5% on debtors. (vi) Commission receivable: 5,000/-.

Q.2(a) Differentiate between explicit cost and implicit cost. [2]

Q.2(b) What is overhead cost? Discuss the following methods of allocation of overhead expenses: [4]
(i) percentage on prime cost, (ii) man-hour rate, (iii) machine-hour rate

Q.2(c) A machine is purchased for cash at Rs. 9,200/-. Its working life is estimated to be 18,000 hours after which its scrap value is estimated at Rs.200/-. it is assumed from past experience that: [6]
(i) The machine will work for 1,800 hours annually. (ii) The repair charges will be Rs. 1,800/- during the whole period of life of the machine. (iii) The power consumption will be 5 units per hour at Rs. 6 per unit. (iv) Other annual standing charges are estimated to be: Rent of department (machine occupies 1/5th of total space): Rs. 780/-; Light of department (among 12 points in the department, 2 points engaged in the machine) Rs. 288/-; Foreman's salary (1/4th of his time is occupied in the machine) Rs. 6000/-; Insurance premium (fire) for machinery Rs. 36/-; Cotton waste Rs. 60/-
Find out the machine hour rate on the basis of above data for allocation of the works expenses to all jobs for which the machine is used.

Q.3(a) Why a larger margin of safety in break-even analysis is helpful for management decision? [2]

Q.3(b) A company is faced with a situation where it can either produce some item by adding additional infrastructure which will cost them Rs. 15,00,000/- but unit cost of production will be Rs. 5/- each. Alternatively, it can buy the same item from a vendor at a rate of Rs. 20/- each. When should the company add to its capacity in terms of demand of items per annum? Draw the diagram to show the break-even point. [4]

Q.3(c) From the following data, calculate break-even point and net sales value at this point: [6]
Direct labour cost: Rs. 5/unit, direct material cost: Rs. 10/unit, fixed overhead: Rs. 50,000, variable overheads @ 60% of direct labour, selling price: Rs. 25/unit, trade discount: 4 %.
If sales are 25% above the break even volume, determine the net profits.

Q.4(a) "A dollar today is worth more than a dollar tomorrow" – Justify the comment [2]

Q.4(b) The new project of Birla Gold Cement factory may generate a revenue base of Rs. 5,00,00,000/- per year. The president of the Birla Group may have reason to be quite pleased with this projection for the simple reason that over the 5-year planning horizon, the expected revenue would total Rs. 25,00,00,000/-, which is Rs. 5,00,00,000/- more than the initial investment. With money worth 10% per year, address the following question from the president: Will the initial investment be recovered over the 5-year horizon with the time value of money considered? If so, by how much extra in present worth funds? If not, what is the equivalent annual revenue base required for the recovery plus the 10% return on money? [4]

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Q.4(c) What are weighted average cost of capital and minimum attractive rate of return? [6]
What do you mean by present worth of cash flow?
Write the formulae for (i) uniform series present worth factor, (ii) arithmetic gradient present worth factor, and (iii) geometric gradient present worth factor.

Q.5(a) What is the difference between a revenue and a cost alternative? [2]

Q.5(b) Ten years ago, Rana purchased a wrecker for Rs. 2,85,000/- to move disabled 18-wheelers. He anticipated a salvage value of Rs. 50,000/- after 10 years. During this time his average annual revenue totaled Rs. 52,000/-. (a) Did he recover his investment and a 15% per year return? (b) If the annual maintenance and operation cost was Rs. 10,000/- the first year and increased by a constant Rs. 1,000/- per year, was the annual worth positive or negative at 15% per year? Assume the Rs. 50,000/- salvage was realized. [4]

Q.5(c) Two processes can be used for producing a polymer that reduces friction loss in engines. Process T will have a first cost of Rs. 7,50,000/-, an operating cost of Rs. 60,000/- per year, and a salvage value of Rs. 80,000/- after its 2-year life. Process W will have a first cost of Rs. 13,50,000/-, an operating cost of Rs. 25,000/- per year, and a Rs. 1,20,000/- salvage value after its 4-year life. Process W will also require updating at the end of year 2 at a cost of Rs. 90,000/-. Which process should be selected on the basis of a future worth analysis at an interest rate of 15% per year? [6]

Q.6(a) Explain replacement analysis by citing the reasons for replacement of assets [2]

Q.6(b) Derive the replacement model to optimize maintenance cost which increases with increase in time (consider that the time is measured continuously) and value of money remains constant during a period. [4]

Q.6(c) One of the four machines are considered for replacement. The initial cost of this machine is Rs. 80,000/-. Its maintenance cost and salvage values are summarized in the below given table. [6]

Year	1	2	3	4	5	6	7	8	9
Maintenance cost	15,000	17,000	18,000	20,000	29,000	30,000	36,000	39,000	41,000
Salvage value	45,000	42,000	40,000	38,000	37,000	25,000	21,000	21,000	21,000

(i) Determine the best replacement age of this machine if the value of money remains constant with time.
(ii) Determine the best replacement age of this machine if the value of money changes with time at 15% per annum rate of interest

Q.7(a) Explain factors affecting depreciation of assets [2]

Q.7(b) The initial cost of a piece of construction equipment is Rs.35,00,000/-. It has useful life of 10 years. The estimated salvage value of the equipment at the end of useful life is Rs.5,00,000/-. Calculate the annual depreciation and book value of the construction equipment at end of eight year using straight-line method. [4]

Q.7(c) A new machine costs Rs. 12,000/- and has a Rs. 1,200/- salvage value after using it for eight years. [6]
(i) Prepare a depreciation schedule for first three years by using diminishing balance method.
(ii) Prepare the depreciation schedule for first four years using appropriate method of calculating depreciation. If the organization decides to invest the depreciated value in bank at 15% per annum rate of interest other than in business operations.

Supplementary data (for Q. 5-7)

Discrete Cash Flow: Compound Interest Factors (at interest rate 15%)

	Single Payments		Uniform Series Payments				Arithmetic Gradients	
n	Compound Amount F/P	Present Worth P/F	Sinking Fund A/F	Compound Amount F/A	Capital Recovery A/P	Present Worth P/A	Gradient Present Worth P/G	Gradient Uniform Series A/G
1	1.1500	0.8696	1.00000	1.0000	1.15000	0.8696		
2	1.3225	0.7561	0.46512	2.1500	0.61512	1.6257	0.7561	0.4651
3	1.5209	0.6575	0.28798	3.4725	0.43798	2.2832	2.0712	0.9071
4	1.7490	0.5718	0.20027	4.9934	0.35027	2.8550	3.7864	1.3263
5	2.0114	0.4972	0.14832	6.7424	0.29832	3.3522	5.7751	1.7228
6	2.3131	0.4323	0.11424	8.7537	0.26424	3.7845	7.9368	2.0972
7	2.6600	0.3759	0.09036	11.0668	0.24036	4.1604	10.1924	2.4498
8	3.0590	0.3269	0.07285	13.7268	0.22285	4.4873	12.4807	2.7813
9	3.5179	0.2843	0.05957	16.7858	0.20957	4.7716	14.7548	3.0922
10	4.0456	0.2472	0.04925	20.3037	0.19925	5.0188	16.9795	3.3832