

Centre for Energy Studies
ESL-350, Energy Conservation & Management

MM: 35

Time: 2 hrs

- Q. No. 1. a) To evaluate different projects, discuss the 'internal rate of return' method.
 b) What are salient features of 'sum-of-digits' depreciation method?
 c) An insulated heater costs Rs. 700,000/-, has life time of 5 years and a salvage value of Rs. 100,000/-. Maintenance cost is Rs. 50,000/- per year and saving are Rs. 3,50,000/- per year. Discount rate is 15% and taxation is 34% (always based on net profit). Depreciation is-by straight line method. Find NPV. 2,2,4

- Q. No. 2. a) What are the four temperature ranges in which thermal insulations are divided?. Explain.
 b) A 15 cm external dia pipe, carrying steam at 400°C , is to be insulated so that heat losses are reduced to 605 W/m. Two insulations, whose properties are given below, are analysed. Salvage value is zero for both. The ambient temperature is 20°C and rate of interest is 20%. $h_o=10 \text{ Wm}^{-2}\text{K}^{-1}$

	Calcium Silicate	Fiber Glass
Life	10 years	10 years
Thermal Conductivity (W/m/K)	0.072	0.097
First Cost	Rs. 200 per mm of thickness per linear meter	Rs. 220/-
Taxes and Insurance	0.02 x First Cost	0.015 x First Cost
Maintenance	0.03 x first Cost	zero

On the basis of annualized cost, choose one.

3,5

- Q. No. 3. a) State fan laws used for ventilating system. In what conditions these hold good?
 b) What is the duct-curve? On what conditions do its characteristics depends?
 c). Calculate the static efficiency of a fan driven by a 10 hp motor connected to a duct system such that the operating point is 2.5 in of H_2O at 11000 CFM. If the same system were used to drive the fan at 2.0 in of water, delivering 12000 CFM, What would its static efficiency be? Show that it is impossible to use this system to deliver 15000 CFM at 4.5 in of H_2O . 2,2,4

- Q. No. 4 a) What are the salient features of an energy audit report?
 b) Explain Gas- Turbine Topping Cycle?
 c) A solar water heater system of 120 liter per day capacity, cost Rs. 16,000/- and delivers hot water at 65°C , while the ambient temperature is 22°C . Calculate the cost of delivered energy by assuming 20 years as useful life, no salvage value, 10% discount rate and Rs. 350/- per year as O & M costs. 3,4,4