



FACULTY OF ENGINEERING  
B.E. 2/4 (ECE) I Semester (New) (Main) Examination, December 2011  
ELEMENTS OF MECHANICAL ENGINEERING

Time: 3 Hours]

[Max. Marks: 75

*Note : Answer all questions from Part A, answer any five questions from Part B.*

PART – A

(25 Marks)

1. Write the steady flow energy equation for an open system. 3
2. Compare petrol and diesel engines. 2
3. What is Stefan-Boltzamn law of radiation ? 2
4. Give the classification of heat exchangers. 3
5. Define C.O.P. and what are the units of refrigeration. 3
6. Explain ammonia-water absorption refrigeration system. 3
7. What are the different types of gas flames in gas welding ? 3
8. What do you mean by wire drawing process ? 2
9. What is a compound belt drive ? 2
10. What do you mean by reverted gear trains ? 2

PART – B

(5×10=50 Marks)

11. a) Define enthalpy. Compare it with internal energy. 4  
b) 30 liters of air expands from an initial pressure of 8 bar and temperature 850°C to a pressure of 1 bar and temperature 200°C. Using reference temperature 0°C, find the change in internal energy, enthalpy and index of expansion during the process. Assume  $C_p = 1.005$  and  $C_v = 0.718$  kJ/kg K. 6
12. a) State the Fouriers law of heat conduction.  
Calculate the rate of heat loss for a red brick wall of length 5 m, height 4 m and thickness 0.25 m. The temperature of the inner surface is 110°C and that of the outer surface is 40°C. The thermal conductivity of red brick,  $k = 0.70$  W/mK. Calculate also the temperature at an interior point of the wall, 20 cm distance from the inner wall. 6  
b) Derive an expression for the LMTD of a parallel flow heat exchanger. 4



13. a) With the help of a block diagram, explain the working of simple vapour compression refrigeration system. Show the cycle on T-S and P-H diagrams. 7  
b) What is heating and humidification process ? Represent it on a psychrometric chart. 3
14. a) Explain the principle of arc welding. Give the list of equipment required for electric arc welding. 4  
b) Explain the principles of the following machining processes :  
a) Turning  
b) Drilling  
c) Shaping. 6
15. a) Explain the four bar chain mechanism with suitable sketches. 5  
b) Derive an expression for the length of belt in open belt drive. 5
16. a) Draw the value timing diagram of a 4-stroke SI engine. 3  
b) A single cylinder, 4 stroke cycle I.C engine was tested and following results were obtained.  
Mean height of indicator diagram = 21 mm  
Indicator spring number = 27 kN/m<sup>2</sup>/mm  
Swept volume of cylinder = 14 liters  
Speed of engine = 396 rpm  
Effective brake load = 77 kg  
Effective brake radius = 700 mm  
Fuel consumption = 0.002 kg/sec  
Calorific value of fuel = 44000 kJ/kg  
Determine :  
a) indicated power  
b) brake power  
c) mechanical efficiency  
d) indicated thermal efficiency  
e) brake thermal efficiency. 7
17. Write short notes on **any four** of the following : 10  
a) Clausius inequality  
b) Critical radius of insulation  
c) Thermoelectric refrigeration  
d) Forming process  
e) Condition for maximum power transmission of flat belt drive.