

**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)**

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|--|---|
| 1. Write the steady flow energy equation for an open system.   | 3 |
| 2. Compare petrol and diesel engines.                          | 2 |
| 3. What is Stefan-Boltzmann 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)**

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|--|---|
| 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 Fourier's law of heat conduction.<br>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 : 6
- a) Turning
- b) Drilling
- c) Shaping.
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 valve 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.