COMBINED COMPETITIVE EXAMINATION (MAIN)

MECHANICAL ENGINEERING

Paper—II

Time : 3 hours *Full Marks* : 200

Note : *(1) The figures in the right-hand margin indicate full marks for the questions.*

*(2) Attempt **five** questions in all.*

*(3) Question No. **1** is compulsory.*

1. Answer any *ten* questions from the following : 4×10=40

(a) Define the thermodynamic processes in which the state of a system changes and some properties vary from their original values.

(b) Explain the first law of thermodynamics applied to closed systems.

(c) Explain the Clausius statement of the second law of thermodynamics.

(d) What does the octane number of a fuel mean?

(e) How does a fuel injector work?

(f) What are the causes and effects of emissions from automobiles?

(g) A wall of a house, 7 m wide and 6 m high, is made from 0·3 m thick bricks having thermal conductivity of 0·6 W/mK. The surface temperatures inside and outside of the wall are 16 °C and 6 °C respectively. Find the total heat loss through the wall.

(h) Determine the ideal coefficient of performance (COP) of an absorption refrigerating system in which the heating, cooling and refrigeration take place at temperatures of 197 °C, 17 °C and –3 °C respectively.

(i) Define the processes described through psychometric chart.

(j) What are the principal components of a turbomachine?