

MECHANICAL ENGINEERING

Time: 3 hrs

Full marks: 200

Note: Answer question No 1 and any four from the remaining seven questions.

All questions carry equal mark.

Q. No. 1 - Attempt any 10 (ten) questions from the following: 10x4=40

- A. What do you mean by the terms 'calorific value', 'upper calorific value' and 'lower calorific value, of fuels? Name an apparatus used for measuring CV of fuels.
- B. What is the velocity of a fluid leaving a nozzle, if the velocity of approach is very small?
- C. What is PMM2? Why is it impossible?
- D. The outer surface of a glass filled with iced water frequently sweats. Explain the cause of the sweating.
- E. Equipments made of brass have a tendency of getting cracked when worked with sea water. Explain why?
- F. What are the basic constituents of high speed steel? What are the common uses of high speed steel?
- G. State and explain Bernoulli equation. List the assumptions made during its formulation.
- H. How are methane based refrigerants denoted? Explain with two examples.
- I. What is Curie temperature? What is its value for iron and copper?
- J. What is a fusible plug and state where it is located in a boiler?
- K. Write the four symbols used for drawing process flow chart.
- L. What are cupolas? Give an outline of the construction of a cupola.

Q. No. 2 - Attempt any 8 (eight) questions from the following: 8x5=40

- A. Find the absolute pressure of a system in kPa when the pressure reading is 90 cmHg gauge and barometer reading is 760 mm of Hg.
- B. An engine of 100 kW capacity requires 15 kW to start the engine. Find its mechanical efficiency.
- C. A mild steel bar of section 20 mm x 40 mm and length 400 mm is subjected to an axial tensile load of 120 kN. If $E = 208 \text{ kN/mm}^2$, what will be the change in length of the bar?
- D. A force of magnitude 125 N has a component in x direction equal to 100 N. What is the component of force in y direction?
- E. The temperature of the freezer of a domestic refrigerator is maintained at -16°C whereas the ambient temperature is 35°C . If the heat leaks into the freezer at a continuous rate of 2 kJ/s, what is the minimum power required to pump out this heat leakage from freezer continuously?