# MACHANICAL ENGINEERING

1.Write critical notes on any four of the following: (4x7½=30)

(a)Differentiate between kinematics and kinetics, explain how these terms are concerned for the mechanism used to lift car window glass.

(b) Differentiate between macro-structure, micro-structure and crystal structum of metal. Give their industrial applications.

(c) For the cantilever beam loaded as shown below, write equations for shearing force and bending moment at any point along the length of beam. Also, draw the shearing force and bending moment diagram:
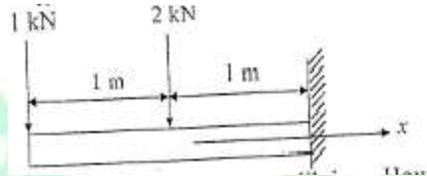
(d) Define thermodynamic equalibrium. How is it different from steady state?

(e) Draw the dual combustion cycle on P-V and T-S planes and explain its working.

(f) Obtain the expression for μ^0 in the state of an ideal gas, i.e. $\mu^0 + RT \log p$ where μ^0 is only a function temperature.

Part I

2.(a) Draw TTT diagram for cuctoid steel and hypoeuctoid steel and draw cooling line for annealing and hardening.
How does alloying will influence these TTT curves?

(b) In a machining process. Explain the factors which affect the accuracy of machined surfaces. Suggest various ways of reducing chatter.

(c) What are the advantages of numerically controlled machines? How does automation is having an important impact on production of high as well as low volume products?   (30)

3.(a) Define the terms : use value. Esteem value. Cost value and exchange value as related to value engineering. What are the value tests for developing better value alternatives?

(b) Differentiate between the principle of Electro-Chemical Machining (ECM) and Electro-Discharge Machining (EDM) Discuss advantages and disadvantages of ECM.

(c) What is Total Quality Management (TQM)? Differentiate between fig and Fixture giving simple sketch for each of them.   (30)

4.(a) How does grain size in a polycrystalline solid affect the strength of the solid? What happens to grain size in (i) forging (hot), (ii) hot rolling followed by cold rolling?

(b) What is Stress Corrosion Cracking ? Differentiate between corrosion fatigue and thermal fatigue.

(c) What is form stability of a cutting tool? Discuss the properties required for an ideal cutting tool material.   (30)

Part II

5.(a) Discuss the advantages of fuel injection in SI engines over carburation. How does mixture strength affect the concentration of carbon monoxide, hydrocarbons and oxides of nitrogen in SI engine exhaust?

(b) Distinguish between nucleate boiling and film boiling and discuss a typical pool boiling curve. How can you create nucleation sites on metal surface to enhance Boiling heat transfer?

(c) With reference to the refrigeration and air conditioning practice. Explain why ammonia which is very good refrigerant, is not used in domestic vapour compression refrigeratiors. (30)

6.(a) What is a deaerator, why and where is it used in thermal power plants?

(b) Explain how would you find whether a refrigeratior is undercharged or over-charged. How would you detect leaking of refrigerant from a refrigerator?

(c) Why Hydrocarbons such as propane and butane are being tried as substitutes for freon refrigerants?
(30)

7. A diesel engine receives (0.7) [kg Air/S] at 1 [bar] and 60 [^{0}C]. The temperature at the end of compression is 900 [K]. The cut-off occurs at 9% of the stroke. The relative efficiency with respect to the brake power is 60%. The calorific value of the fuel is 43.03 [MJ/kg F]. Cut off ratio is 1.99. Calculate:

(a) n_{as}

(b) BP

(c) $n_{b.th}$ (30)