

Roll No.

1208

B. E. 1st Sem. (E. Scheme : (New))

Examination May, 2007

ELEMENTS OF MECH. ENGG.

Paper: ME-101 E

Time : Three hours]

[Maximum Marks : 100

Before answering the question, candidate should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any five questions. Use of steam table is allowed.

1. (a) Enumerate the factors which should be considered while selecting a boiler. 6
- (b) Give comparisons between 'Fire tube boiler' and 'water tube boiler'. 6
- (c) 1kg of steam undergoes of reversible isothermal process from 20 bar and 250°C to a pressure of 30 bar. Calculate the heat flow, stating whether it is supplied or rejected and sketch the process on a T - S diagram. 8
2. (a) Explain with the help of neat sketch a single-stage impulse turbine. Also explain the pressure and velocity variations along the axial direction. 8

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- (b) Explain the effects of air leakage in a condenser. 6
- (c) What are the sources of air in the condenser? 6
3. (a) Describe with a suitable sketch the two-stroke cycle spark ignition engine. 6
- (b) Enumerate the various uses of gas turbines. 7
- (c) State the merits of gas turbines over IC engines and steam turbines. 7
4. (a) Draw a schematic diagram of a Francis turbine and explain briefly its construction and working. 7
- (b) How reciprocating pumps are classified. 7
- (c) With the help of a neat sketch explain the working and principle of Hydraulic Jack. 7
5. (a) Explain the working of worm and worm wheel. Also make calculation for velocity ratio, Mechanical advantage and efficiency of the system. 10
- (b) In a system where same rope constantly passes round all the pulleys, the load to be lifted is 1350 N and effort is of magnitude of 400 N. The weight of the lower block is 50 N. If the number of pulleys is 4. Find the efficiency of the system. 10

6. (a) Explain briefly an epicyclic gear train. What are the special advantages of epicyclic gear trains? 10

(b) Explain with the help of neat diagram a belt transmission dynamometer. 10

7. (a) A reinforced concrete column is $300 \text{ mm} \times 300 \text{ mm}$ in section. The column is provided with 8 bars each of 20 mm diameter. The column carries a load of 360 kN . Find the stresses in concrete and the steel bars. Take $E_s = 210 \text{ GN/m}^2$ and $E_c = 14 \text{ GN/m}^2$. 10

(b) Mutually perpendicular faces of a square element of a thin plate are subjected to normal and shear stresses of 63 MN/m^2 (tensile), 47.2 MN/m^2 (Compressive) and 39.4 MN/m^2 (shear). Determine graphically the magnitude and direction of the principle stresses and the greatest shearing stress. 10

8. Draw shear force and bending moment diagram for the beam shown in fig. Also find the point of contra flexure. 20

