

SECTION-B

2. In a gas turbine unit, the gases flow through the turbine is 20 kg/s and the power developed by the turbine is 16000 KW. The enthalpies of gases at the inlet and outlet are 1260 KJ/kg and 400 KJ/kg respectively, and the velocity of gases at the inlet and outlet are 50 m/s and 110 m/s respectively. Calculate :
 - (a) The rate at which heat is rejected by the turbine.
 - (b) The area of the inlet pipe if the specific volume of the gases at inlet is $0.40 \text{ m}^3/\text{kg}$.
3. State and explain the second law of thermodynamics.
4. One kg of air enters a compressor at 10^5 Pa and 25°C having volume of 1.8 m^3 and is compressed to $5 \times 10^5 \text{ Pa}$ isothermally. Determine :
 - (a) Work done
 - (b) Change in internal energy
 - (c) Heat transferred.
5. State and prove the Zeroth's law of thermodynamics.

SECTION-C

6. Explain the working principle of Diesel cycle with the help of PV and TS diagrams.
7. (a) What are metals? How metals are different from non-metals?
(b) Write the composition, applications, advantages of cast iron and stainless steel.
8. (a) Derive the expressions for centroid of I and circular section.
(b) From a rectangular lamina ABCD in which $AB = 60\text{cm}$ and $BC = 40\text{cm}$, a triangular piece OBC is removed such that $CO = BO = 25\text{cm}$. Calculate the CG of the remainder.
9. An engine working on Otto cycle has the following conditions :
Pressure at the beginning of compression = $1 \times 10^5 \text{ N/m}^2$ Pressure at the end of compression = 10 bar. Calculate the air standard efficiency of the engine, Take $\gamma = 1.4$.