

GANPAT UNIVERSITY
B.TECH SEM. I (ME/MC/CIVIL/EE)
Regular Examination November – December 2014
2ME101 ELEMENTS OF MECHANICAL ENGINEERING

TIME: -3 Hours.

TOTAL MARKS- 60

- Instructions:**(1) Attempt all questions.
 (2) Figure to the right indicates full marks.
 (3) Assume required data if necessary.

SECTION-I

Q-1 Answer the following questions.

- (a) Define a) Latent Heat b) Higher calorific Value c) Lower Calorific Value d) Entropy e) Zeroth law of thermodynamics. [05]
- (b) Derive an expression for air standard efficiency of Diesel cycle [05]

OR

Q-1 Answer the following questions.

- (a) Define a) Prime Mover b) Extensive property c) High grade energy d) Enthalpy e) First law of thermodynamics [05]
- (b) In an Otto cycle the maximum temperature and minimum temperature are 1673 K and 228 K. The heat supplied per kg of air is 800 kJ. Calculate a) Compression ratio and b) Efficiency of the cycle. [05]

Q-2 Answer the following questions.

- (a) Prove that $C_p - C_v = R$ [05]
- (b) A cylindrical vessel of 1m diameter and 4m length has hydrogen gas at pressure of 100 kPa and 27°C. Determine the amount of heat to be supplied so as to increase pressure to 125 kPa. For Hydrogen, take $C_p = 14.307$ kJ/kg K, $C_v = 10.183$ kJ/kg K [05]

OR

Q-2 Answer the following questions.

- (a) An ideal gas is heated from 25°C to 145°C. The mass of gas is 2 kg. Determine a) C_p and C_v b) ΔU c) ΔH . Take $R = 287$ J/kg K and $\gamma = 1.4$ for gas. [05]
- (b) Determine the work done in compressing 1 kg of air from a volume of 0.15 m³ at a pressure of 1 bar to a volume of 0.05 m³, when the compression is a) Isothermal and b) Adiabatic. Take $\gamma = 1.4$ [05]

Q-3 Answer any two of the following questions.

- (a) Explain construction and working of Babcock and Wilcox boiler with neat sketch. [5x2=10]
- (b) Explain a) Dryness Fraction b) Enthalpy of evaporation and c) Degree of Super heat d) Wet steam e) Wetness Fraction.
- (c) Give classification of steam boilers in detail.

SECTION-II

Q-4 Answer the following questions.

- (a) The following results refer to a test on C.I engine. [05]
I.P = 37 kW, F.P = 6 kW, B.sfc = 0.28 kg/kWh and C.V = 44300 kJ/kg.
Calculate a) Mechanical efficiency b) Brake thermal efficiency. c) Indicated thermal efficiency.
- (b) Differentiate between S.I engine and C.I engine. [05]

OR

Q-4 Answer the following questions.

- (a) A petrol engine having a compression ratio of 7 has a brake thermal efficiency which is 40% of the ideal air standard efficiency. The calorific value of the fuel used is 42000 kJ/kg. Calculate the fuel consumption in kg per hour if engine delivers 15 kW. [05]
- (b) Differentiate between 2 stroke and 4 stroke engine. [05]

Q-5 Answer the following questions.

- (a) Compare Belt, Chain and Gear Drive. [05]
- (b) Define a) Priming b) C.O.P c) Pump d) Air conditioning e) Slip in a pump [05]

OR

Q-5 Answer the following questions.

- (a) Derive an expression for work done in reciprocating air compressor with clearance volume. [05]
- (b) Explain in detail about VCR cycle with the help of p-h diagram. [05]

Q-6 Answer any two of the following questions.

- (a) What is governor? Explain Quality and Quantity governing in detail. [5x2=10]
- (b) Define a) Elasticity b) Hardness c) Resilience d) Toughness e) Stiffness
- (c) What is the function of Coupling? Differentiate between brake and clutch.

END OF PAPER