

GANPAT UNIVERSITY
B.TECH 1st SEM ME/MC/EE/CIVIL
CBCS REGULAR EXAMINATION NOV/DEC-2013
ELEMENTS OF MECHANICAL ENGINEERING (2ME 101)

TIME:-3 HOURS

TOTAL MARKS-70

- 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.

[12]

- (a) Explain the process of formation of steam with the help of neat sketch.
 (b) Give the comparison between fire tube boiler and water tube boiler.

OR

Q-1 Answer the following questions.

[12]

- (a) Explain the construction and working of separating calorimeter with neat sketch.
 (b) Draw the neat sketch of Babcock and Wilcox boiler with usual notations.

Q-2 Answer the following questions.

[11]

- (a) Prove that for an adiabatic process $PV^\gamma = \text{Constant}$ where γ is the ratio of specific heat at constant pressure to the specific heat at constant volume. 05
 (b) An ideal four-stroke Otto cycle engine has compression ratio of 6.3. The temperature at the beginning of compression is 18°C . Heat supplied during combustion is 3225 kJ/kg . Using $\gamma = 1.3$ for air and $R = 0.287 \text{ kJ/kg K}$, for 1 kg of air, calculate: (1) The temperature at the end of compression (2) The temperature rise during combustion (3) The net work of the cycle (4) Cycle efficiency. 06

OR

Q-2 Answer the following questions.

[11]

- (a) Derive an expression for the thermal efficiency of Diesel cycle with P-V and T-s diagram. 05
 (b) A cylinder contains 0.5 m^3 of a gas at 1 bar and 90°C . The gas is compressed to a volume of 0.125 m^3 . The final pressure is 6 bar. Determine (1) Mass of the gas (2) The value of n (3) Increase in internal energy (4) Heat received or rejected by the gas during compression. Take $\gamma = 1.4$ and $R = 292.2 \text{ J/kg K}$. 06

Q-3 Answer the following questions. (Any three)

[12]

- (a) Define: (i) Prime movers (ii) Reversible process (iii) Internal energy (iv) path.
 (b) Write a short note on LPG & CNG.
 (c) Derive an expression for PVT relationship, work done, change in internal energy and heat transfer during an isothermal process.
 (d) Define: (i) Dryness fraction (ii) Enthalpy of saturated steam (iii) Wet steam (iv) Enthalpy of evaporation.

SECTION-II

- Q-4 Answer the following questions.** [11]
- (a) Explain the working principle of four stroke cycle petrol engine with neat sketch. 06
- (b) Explain the vapour compression refrigeration system with neat sketch. 05

OR

- Q-4 Answer the following questions.** [11]
- (a) What is Refrigerant? State the desirable characteristics of a refrigerant. 06
- (b) Give the comparison between petrol engine and diesel engine. 05

- Q-5 Answer the following questions.** [12]
- (a) Define following terms related to air compressor: (i) Mechanical efficiency (ii) Free air delivery (iii) Clearance ratio (iv) Swept volume (v) Positive displacement (vi) Isothermal efficiency.
- (b) Explain (i) Simple gear train (ii) Epicyclic gear train.

OR

- Q-5 Answer the following questions.** [12]
- (a) What is Individual drive and group drive? Give the comparison between them.
- (b) A compressor compresses air from 1 bar to 7 bar. The clearance volume is 2.13 liters and the compression and expansion are polytropic with $n = 1.3$ for each. If volumetric efficiency is 85%, calculate (1) The stroke volume (2) The diameter of the cylinder if the length of the stroke be 300 mm.

- Q-6 Answer the following questions. (Any three)** [12]
- (a) Define governor. Explain construction and working of Watt governor with neat sketch.
- (b) What is priming? Explain working of centrifugal pump with neat sketch.
- (c) Derive the equation for volumetric efficiency of air compressor.
- (d) Explain the working of two stroke cycle diesel engine with neat sketch.

END OF PAPER