

Date: 30/05/2017.

Student Exam No. _____

New
GANPAT UNIVERSITY

B. Tech. Semester: I & II (All Branch)

CBCS Regular Examination: May/June - 2017

2ME101 - Elements of Mechanical Engineering

Total Marks: 60

Time: 3 Hours

Instructions: 1) All questions are compulsory
2) Figure to the right indicates full marks.

Section-I

- Que. - 1 a) Define thermodynamic work? How work done is designated? Why? [4]
Which sign convention is used for work?
- b) Differentiate between a) System and surrounding, b) Intensive and [6]
Extensive properties, c) Open system and closed system.

OR

- Que. - 1 a) What is volumetric efficiency of air compressor? Derive an expression [4]
$$\eta_{vol} = 1 - C \left[\left(\frac{P_2}{P_1} \right)^{\frac{1}{n}} - 1 \right]$$
- b) Explain the terms: (i) melting point, (ii) boiling point, (iii) critical point, [6]
(iv) path function, (v) point function, (vi) flow work.
- Que. - 2 a) What is N.T.P and S.T.P? Derive an expression of work done when a gas [5]
is expanded as per law $PV^\gamma = C$ with usual notations.

- b) 0.15 m^3 of air at pressure of 900 kPa and 300°C is expanded at constant [5]
pressure to 3 times its initial volume. It is expanded polytropically
following the law $PV^{1.5} = C$ and finally compressed back to initial state
isothermally. Calculate heat received, heat rejected, efficiency of cycle.

OR

- Que. - 2 a) What is isothermal process? Derive an expression for the work done [5]
during the isothermal process.
- b) An ideal gas is heated from 25°C to 145°C . The mass of gas is 2 kg. [5]
Determine (i) Specific heats (ii) change in internal energy, (iii) change in
enthalpy. Assume $R = 267 \text{ J/Kg K}$ and $\gamma = 1.4$ for the gas.

- Que. – 3 a) With neat sketch explain construction and working of throttling and separating combined calorimeter. [5]
- b) The following information is available from test of a combined separating and throttling calorimeter. Pressure of steam in a steam main = 9.0 bar, Pressure after throttling = 1.0 bar, Temperature after throttling = 115°C, Mass of steam condensed after throttling = 1.8 Kg, Mass of water collected in the separator = 0.2 Kg. Calculate the dryness fraction of the steam in the main. [5]

Section-II

- Que. – 4 a) Derive an expression for air standard efficiency of Otto cycle. [5]
- b) Describe the working of a Lancashire boiler with neat sketch. [5]

OR

- Que. – 4 a) A six cylinder 4 stroke I.C engine is to develop 89.5 kW indicated power at 800 rpm. The stroke to bore ratio is 1.25:1. Assuming mechanical efficiency of 80% and mean effective pressure of 5 bar. Determine the diameter and stroke of the engine. [5]
- b) Explain with neat sketch the construction and working of Babcock and Wilcox boiler, advantages, disadvantages and application. [5]

- Que. – 5 a) With neat sketch explain working of four stroke Diesel engine. [5]
- b) Explain following terms related to I. C. Engines, (i) Indicated power (ii) Brake power (iii) Indicated thermal efficiency (iv) Friction power (v) Mechanical efficiency. [5]

OR

- Que. – 5 a) Classify centrifugal pump and explain volute type, vortex or diffuser type centrifugal pump. [5]
- b) With a simple sketch explain the working of disc clutch. [5]
- Que. – 6 a) Describe in brief the various non-ferrous metals along with their applications. [5]
- b) With neat sketch describe the working of vapour compression refrigeration cycle with P-H diagram. [5]

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