

Date: 19/05/2016.

Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM- IV (Marine) REGULAR EXAMINATION- APRIL-JUNE 2016
2MR404 Heat Engines

TIME: 3 HRS

TOTAL MARKS: 60

- Instructions:** (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

- Q.1 (a) Consider an air standard otto cycle that has a heat addition of 2800 kJ/kg of air, a compression ratio of 8 and a pressure and temperature at the beginning of compression process of 1 bar, 300K determine (a) the maximum pressure and temperature in the cycle (10)
(b) The thermal efficiency and mean effective pressure. For air $C_p = 1.005$ KJ/kg k, $C_v = 0.718$ KJ/kg k, and $R = 287$ KJ/kg k.

OR

- Q.1 (a) The upper and lower temperature limits for an Otto cycle are 1500 K and 300 K respectively. What compression ratio is required to develop maximum work? Estimate the maximum theoretical power developed by an engine working on this cycle when the air flow rated is 0.35 kg/min, where $C_v = 0.718$ KJ/kg k. (10)

- Q.2 (a) Find the Efficiency of Rankin cycle steam power plant with use of T-S and H-S Diagram. (5)

- (b) Write short note on Francis Turbine. (5)

OR

- Q.2 (a) Differentiate between Impulse and Reaction Turbine. (5)

- (b) Derive an equation for the condition of maximum energy transfer in case of reaction Turbines. (5)

- Q.3 (a) A steam turbine working on Rankine cycle is supplied with dry saturated steam at 25 bar and the exhausted takes place at 0.2 bar. For a steam flow rate of 10 kg/s, determine (10)
(1) Quality steam at end of expansion, (2) turbine shaft work, (3) power required to drive the pump, (4) work ratio, (5) Rankine Efficiency and (6) heat flow in the condenser.

SECTION: II

- Q.4 Write a Short Note on Absorptivity, Reflectivity, and Transmissivity in detail with suitable example. (10)

OR

- Q.4 (a) Explain and Derive the Wien's Displacement law. (05)

- (b) Explain Fourier Law with its characteristic in detail. (05)

- Q.5** (a) Draw the neat sketch of Pressure Compounded Impulse turbine and explain its working.
 (b) An insulated steam pipe of 16 cm diameter is covered with 4 cm thick layer of insulation. ($k=0.9$ W/m-deg) and carries process steam. Determine the percentage change in the rate of heat loss if an extra 2 cm thick layer of lagging ($k=1.25$ W/m-deg) is provided. Given that surrounding temperature remains constant and the heat transfer coefficient for both the configuration is $12 \text{ W/m}^2 - \text{deg}$.

OR

- Q.5** (a) Write short note on Parson's Turbine. (05)
 (b) Explain Kirchhoff's Law in detail. (05)
- Q.6** Derive the Equation for the conduction Through a Cylindrical Wall and Multi Cylinder Wall. (10)

-----END OF PAPER-----