

**FACULTY OF ENGINEERING****B.E. 3/4 (Mech.) I-Semester (New) (Main) Examination, Nov. / Dec. 2016****Subject : Applied Thermodynamics****Time : 3 hours****Max. Marks : 75****Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.****PART – A (25 Marks)**

- 1 Explain the difference between double acting and double stage reciprocating air compressor.
- 2 Write the importance of inter cooler in the air compressor.
- 3 Define brake thermal efficiency and indicated thermal efficiency of an I.C. engine.
- 4 Explain the variation of air fuel ratio in best power condition and best economy condition.
- 5 Define cetane number of a fuel.
- 6 What is antiknock agent and its importance in a gasoline fuel?
- 7 Write few words on economizer in a steam boiler.
- 8 What is equivalent evaporation 'from and at 100°C'?
- 9 Define Nozzle efficiency.
- 10 Define heat rate in Rankine cycle.

**PART – B (5 x 10 = 50 Marks)**

- 11 a) Derive an expression for volumetric efficiency of a reciprocating air compressor.  
b) A single acting water cooled air compressor was originally installed to deliver air at an absolute pressure of 6bar having 4% clearance volume. It is proposed to increase the delivery pressure to 8bar keeping the speed of the machine unchanged. The compressor is capable of working under the new conditions but the driving motor is already loaded to its maximum rated capacity and can accept on increase in load. Calculate the percentage increase in the compressor clearance volume. Which at the new delivery pressure, will ensure that driving power remains unchanged. How will be the mass of air delivered be affected? Assume the mechanical efficiency of the compressor is independent of the load and the law of compression in both cases  $p v^{1.3} = c$  the suction pressure is 1 bar.
- 12 a) Define i) relative efficiency      b) brake thermal efficiency      c) indicated thermal efficiency  
b) A 42.5 kW engine has a mechanical efficiency of 85%. Find the indicated power and frictional power. If the frictional power is assumed to be constant with load, what will be the mechanical efficiency at 60% of the load.
- 13 a) Explain the combustion phenomenon in C.I. engine.  
b) Explain abnormal combustion in C.I. engine.

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- 4 a) Define draught in the boilers.  
b) Write down the differences water tube boiler and fire tube boiler.
- 5 Explain the reheat cycle in Rankine cycle with a neat sketch and derive its efficiency.
- 6 a) Explain the types of nozzles and derive the velocity of steam through the nozzle.  
b) Dry saturated steam at 5 bar with negligible velocity expand isentropic ally in a convergent nozzle to 1 bar and dryness fraction 0.94. Determine the velocity of steam leaving the nozzle.
- 7 Write short notes on the following :
- a) Mist type lubrication
  - b) Thermosiphon cooling system
  - c) Flame front propagation

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