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## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech -Electrical Engineering

Semester – V

Subject (Course): Thermal and Hydraulic equipment

Max. Marks : 100

Course Code : MHEG374

Duration : 3 Hrs

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### Section A: 4 marks each (Attempt all questions)

- 1) Define the term Manometric head with its expression.
- 2) Explain the operation of axial flow compressor.
- 3) Differentiate between turbines and pumps
- 4) Explain working of reciprocating pump.
- 5) Differentiate between SI and CI engines.

### Section B: 10 marks each (Q 6-8 are MANDATORY, attempt any ONE PART of Q 9)

- 6) Derive the expression for efficiency of otto cycle with help of P-v and T- s diagram with stated assumptions.
- 7) Explain briefly the different types of hydraulic reaction turbines with their specifications and velocity triangles.
- 8) Explain Velocity and Pressure compounding w.r.t to impulse steam turbine.
- 9) A two stage air compressor with perfect intercooling takes in air at 1 bar pressure and 27°C. The law of compression in both stages is  $PV^{1.3}=\text{constant}$ . The compressed air is delivered at 9 bar from the HP cylinder to an air receiver. calculate per kg of air a) ideal intermediate pressure  
b) The minimum work done  
c) The heat rejected to the intercooler

or

Derive the expression of volumetric efficiency of a compressor with stated assumptions. On what factors does it depend.

**Section C: 20 marks each**

- 10) a) Explain the working of compression ignition engine with help of piston cylinder diagram.  
b) An ideal diesel cycle with air as the working fluid has a compression ratio of 18 and a cut off ratio of 2. At the beginning of compression, the air is at 100 kpa, 27°C and 1917 cm<sup>3</sup>. determine a) The pressure and temperature of air at each point b) the net work and thermal efficiency c) mean effective pressure
- 11) A centrifugal pump having outer diameter = 2 \* inner diameter running at 1000 rpm works against a total head of 50 m. The velocity of flow through the impeller is const. = 2.5 m/s. The vanes are set back at an angle of 30° at outlet. if the outer diameter of impeller is 500 mm and width at outlet is 50 mm. determine
- Vane angle at inlet.
  - Work done by impeller on water per sec.
  - Manometric efficiency.

**Or**

- Define specific speed of a centrifugal pump. Derive an expression of the same.
- Draw and explain the main characteristic curves and operating curves of centrifugal pump.