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Question Paper Code: 31474

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fourth Semester

Mechanical Engineering

01UME404 – THERMAL ENGINEERING

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

(Use of Steam table, Psychrometric chart are permitted)

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. A Carnot cycle works between the temperatures 300K and 700K. Find the maximum work possible per kg of air.
2. Define mean effective pressure.
3. What are various methods to determine the FHP of the engine?
4. What are the basic requirements of a fuel injection system of a diesel engine?
5. What is the effect of friction on the flow through a steam nozzle?
6. Define 'Degree of reaction' in a steam turbine.
7. Define volumetric efficiency of a reciprocating compressor.
8. What is the main advantage of inter cooling in a multi stage reciprocating compressors?
9. What is the basic difference between vapour compression and vapour absorption refrigeration system?
10. Define the terms RSHF and GSHF.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive an expression for the air standard efficiency and MEP of a diesel cycle. (16)

Or

- (b) An engine 20 cm bore and 30 cm stroke works on Otto cycle. The clearance volume is 1600cm^3 . The initial pressure and temperature are 1 bar and 60°C . If the maximum pressure is limited to 24 bar, find the following:

(i) The air standard efficiency of the cycle (10)

(ii) The mean effective pressure of the cycle (6)

12. (a) (i) Explain why cooling is necessary in an I.C. engine. (4)

(ii) With neat sketches describe the working of water cooling system used for multi-cylinder engine. (12)

Or

- (b) Describe the working of a simple carburetor with neat sketch. (16)

13. (a) Dry saturated steam at 2.8 bar pressure is expanded through a convergent nozzle to 1.7 bar. The exit area is 3 cm^2 . Estimate the exit velocity and the mass flow rate, assuming isentropic expansion and super saturated flow exists. (16)

Or

- (b) (i) Explain with sketches the working principle of a single stage reaction turbine. (8)

(ii) Explain the working of throttle governing with neat sketch. (8)

14. (a) In a two stage compressor in which inter cooling is perfect, prove that work done in the compressor is minimum when the pressure in the intercooler is geometric mean between the initial and final pressure. Draw the P-V and T-S diagram for two stage compression. (16)

Or

- (b) Explain the volumetric efficiency and power consumption of a single stage single acting reciprocating compressor, given the following data.

Cylinder diameter : 30 cm

Stroke : 22 cm

Clearance ratio : 0.03

Delivery pressure : 8 bar

Suction pressure : 1 bar

Speed : 400 rpm

Compression and expansion follows $pv^{1.3} = \text{constant}$. (16)

15. (a) With help of a suitable sketch explain the working of lithium bromide-water based vapour absorption system. Also list the advantages and disadvantages of vapour absorption systems. (16)

Or

- (b) (i) Define relative humidity, dew point temperature, and wet bulb temperature. (6)
- (ii) $100m^3$ of air per minute at $15^\circ C$ DBT and 80% RH are heated until its temperature is $22^\circ C$. Calculate heat added to air per minute, R.H of the heated air and wet bulb temperature of the heated air. (10)
