**Code: 13A03402**

**R13**

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

**THERMAL ENGINEERING – I**

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

**PART – A**

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Mention the ranges of compression ratio for S.I and C.I engines.
(b) What is meant by pre-ignition?
(c) Define indicated power.
(d) Name the four stages of combustion in a C.I engine.
(e) What are causes of knock in C.I engine?
(f) State the function of a carburetor in a petrol engine.
(g) What is isothermal efficiency with reference to reciprocating air compressor?
(h) Write the advantages of multi stage air compressors over equivalent single stage air compressor.
(i) What is the purpose of having fins in the engine cooling system?
(j) What do you mean by 'cetane number' of fuels?

**PART – B**

(Answer all five units, 5 X 10 = 50 Marks)

**UNIT – I**

2 (a) Discuss the difference between theoretical and actual valve timing diagrams of a C.I Engine.
(b) Discuss the relative advantages and disadvantages of internal combustion and external combustion engine.

**OR**

3 Compare SI and CI engines with respect to:
(i) Basic cycle. (ii) Fuel used. (iii) Ignition.
(iv) Compression ratio. (v) Speed. (vi) Efficiency. (vii) Weight.

**UNIT – II**

4 (a) Explain the principle of Magneto ignition system. Enumerate its advantages and disadvantages.
(b) With neat sketches explain the working principle of simple carburetor.

**OR**

5 Explain the following with neat sketches:
(a) Splash Lubrication of IC engines.
(b) Thermosyphon cooling of IC engines.

**UNIT – III**

6 (a) Describe few anti-knock additives for S.I. engine.
(b) Explain the principle of operation of "Lanova air-cell combustion chamber" with a sketch and state its advantages.

**OR**

7 (a) Describe how the following parameters influence the flame speed in an S.I engine:
(i) Turbulence.
(ii) Compression ratio.
(iii) Fuel-air ratio.
(iv) Engine output.
(v) Engine size.
(b) Discuss the various stages of normal and abnormal combustion in S.I engines with a sketch.

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**UNIT – IV**

8 The following observations were made during the test on an oil engine:

B.P of the engine = 31.5 kW
Fuel used = 10.5 kg/hr
C.V of fuel = 43000 kJ/kg
Jacket circulating water = 540 kg/hr
Rise in temperature of cooling water = $56^0$C

Exhaust gases are passed through the exhaust gas calorimeter for finding the heat carried away by exhaust gases. Water circulated through exhaust gas calorimeter = 454 kg/hr. Rise in temperature of water passing through exhaust gas calorimeter = $36^0$C. Temperature of exhaust gas leaving the exhaust gas calorimeter = $82^0$C. A:F ratio = 19:1, Ambient temperature -$17^0$C, Cp for exhaust gases = 1 kJ/kg-K. Draw up the heat balance sheet on minute and percentage basis.

**OR**

9 (a) Describe the methods of measuring the heat lost in exhaust gases of an I.C engine.

(b) Draw the following curves for 4-stroke single cylinder petrol and diesel engines of same power on a common graph. (i) B.P Vs total fuel consumption.
(ii) B.P Vs specific fuel consumption.
(iii) B.P Vs brake thermal efficiency. Comment on the above results.

**UNIT – V**

10 (a) Describe with a neat sketch the construction and working of a single-stage single acting reciprocating air compressor.

(b) What is a rotary compressor? How are rotary compressors classified?

**OR**

11 A single-acting two-stage air compressor deals with 4 $m^3$/min of air under atmospheric conditions of 1.016 Bar and $15^0$C with a speed of 250 rpm. The delivery pressure is 78.65 Bar. Assume complete intercooling. Find the minimum power required, bore and stroke of the compressor. Assume a piston speed of 3 m/s, mechanical efficiency of 75% and volumetric efficiency of 80% per stage. Assume the polytropic index (n) of compression in both stages is 1.25 and neglect clearance.

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