Code: 13A03402 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

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) What methods can reduce delay period?
(b) State the various types of combustion chambers.
(c) Charge lubrication system means.
(d) Write the purpose of plunge in fuel pump.
(e) Define volatility.
(f) What is the use of after burner?
(g) What is meant by piston or cylinder scoring?
(h) What are the uses of compressed air?
(i) Define mechanical efficiency.
(j) What is meant by unleaded gasoline?

PART – B

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

UNIT – I

2 State the development of I.C engines and Classification of I.C. engines.

OR

3 Explain the working principle of four stroke cycle S.I engines with a line diagram.

UNIT – II

4 Explain with a neat sketch the working principle of a compensating jet type of carburetor.

OR

5 Draw a curve representing variation of mixture requirements (fuel-air ration) from on-loan to full-load in a S.I. engine, mark the relative position of stoichiometric fuel-air ratio line and then explain why:
An idling engine requires a rich mixture;
A cruising engine requires an economy mixture;
Maximum power demands a rich mixture;

UNIT – III

6 Explain in detail the combustion phenomenon in C.I engines.

OR

7 Explain the Diesel knock and also the difference in knocking phenomenon of S.I and C.I engines.

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UNIT – IV

8 In a trial of a single – cylinder oil engine working on dual cycle, the following observations were made:

Compression ratio	=	15
Oil consumption	=	10.2 kg/h
Calorific value of fuel	=	43890 kJ/kg
Air consumption	=	3.8 kg/min
Speed	=	1900 r.p.m
Torque on the brake drum	=	186 N-m
Quantity of cooling water used	=	15.5 kg/min
Temperature rise	=	36^0C
Exhaust gas temperature	=	410^0C
Room temperature	=	20^0C
C_p for exhaust gases	=	1.17 kJ/kg K

Calculate: (i) Brake power.
(ii) Brake specific fuel consumption.
(iii) Brake thermal efficiency. Draw heat balances sheet on minute basis.

OR

9 In a test of a four-cylinder, four – stroke engine 75 mm bore and 100 mm stroke, the following results were obtained at full throttle at a particular constant speed and with fixed setting of fuel supply of 6.0 kg/h.

B.P. with all cylinder working	=	15.6 kW
B.P. with cylinder no 1 cut –out	=	11.1 kW
B.P. with cylinder no 2 cut –out	=	11.03 kW
B.P. with cylinder no 3 cut –out	=	10.88 kW
B.P. with cylinder no 4 cut –out	=	10.66 kW

If the calorific value of the fuel is 83600 kJ/kg and clearance volume is 0.0001 m^3.
Calculate: (i) Mechanical efficiency.
(ii) Indicated thermal efficiency.
(iii) Air standard efficiency.

UNIT – V

10 Derive an expression for work done in a two stage reciprocating air compressor with and without inter cooling. Also derive the condition for minimum work required for the same.

OR

11 A single acting reciprocating compressor having L/D ratio = 1.5 has the cylinder diameter of 200 mm runs at 100 rpm. The compressor compresses air at 1 bar, 300 K to a pressure of 8 bar according to the law $pv^{1.25}$ = constant. Find the indicated power of the compressor, mass of air delivered, temperature of air delivered. Also calculate power required to drive the compressor if mechanical efficiency is 80%.

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