Total No. of Questions—8] [Total No. of Printed Pages—4+1

Seat No.	

[4757]-1017

S.E. (Automobile/Mechanical Engineering)

(Second Semester) EXAMINATION, 2015

APPLIED THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Assume suitable data, if necessary.

(*iii*) Draw neat diagrams wherever necessary.

(*iv*) Figures to the right indicate full marks.

1. (*a*) Explain with the help of a P–V diagram the loss due to variation of specific heats in an Otto cycle. [6]

(*b*) With a neat sketch explain the working principle of simple carburetor. [6]

Or

2. (*a*) Draw ideal and actual valve timing diagram for four stroke S.I. engine. [6]

(*b*) Explain the different stages of combustion in S.I. engine. [6]

P.T.O.

3. (*a*) Explain the various factors that influence the delay period in C.I. engine. [6]

(*b*) In a test of a four–cylinder four-stroke petrol engine of 75 mm bore and 100 mm stroke, the following results were obtained at full throttle at a constant speed and with a fixed setting of the fuel supply of 0.082 kg/min. :

BP with all cylinders working = 15.24 kW

BP with cylinder No. 1 cut-off = 10.45 kW

BP with cylinder No. 2 cut-off = 10.38 kW

BP with cylinder No. 3 cut-off = 10.23 kW

BP with cylinder No. 4 cut-off = 10.45 kW

Estimate :

(1) Total indicated power of the engine

(2) Total friction power,

(3) Indicated thermal efficiency of the engine

If the calorific value of the fuel is 44 MJ/kg [7]

Or

4. (*a*) Explain with figures various types of combustion chambers used in CI engines. [6]

(*b*) During the trial of a single cylinder, four-stroke oil engine, the following results were obtained : [7]

Cylinder diameter	= 20 cm
Stroke	= 40 cm
Mean effective pressure	= 6 bar
Torque	= 407 Nm
Speed	= 250 r.p.m.
Fuel consumption	= 4 kg/h
Calorific value of fuel	= 43 MJ/kg
Cooling water flow rate	= 4.5 kg/min
Air used per kg of fuel	= 30 kg of air/kg of fuel
Rise in cooling water temperature	= 45°C
Temperature of exhaust gases	= 420°C
Room temperature	= 20°C
Mean specific heat of exhaust gas	= 1 kJ/kgK
Specific heat of water	= 4.18 kJ/kgK

Find IP, BP and draw heat balance sheet for the test.

5. (*a*) Explain with neat sketch pressurized dry sump lubrication system. [6]

(*b*) Discuss the effect of A : F ratio on emission of : [6]

(1) Unburnt HC

(2) CO

(3) NO_x.

Or

6. (*a*) Explain battery ignition system with neat diagram. [6]

(*b*) Explain exhaust gas recirculation method used to control NO_x emissions. [6]

7. (*a*) What are the advantages of multi-staging in reciprocating air compressor ? [6]

(*b*) During an experiment on reciprocating air compressor the following observations are being taken : [7]

Barometer reading	= 75.6 cm Hg
Manometer reading across orifice	= 13 cm Hg
Atmospheric temperature	= 25°C
Diameter of orifice	= 15 mm
Coefficient of discharge across the orifice	= 0.65
Take density of Hg	= 0.0135951 kg/cm^3

Determine the volume of free air handled by compressor in m^3/min.

Or

8. (*a*) Draw isothermal, polytrophic and isentropic compression on P-V and T-s diagram and compare the three works. [6]

(*b*) Determine the minimum number of stages required in an air compressor which admits air at 1 bar 27°C and delivers at 180 bar. The maximum discharge temperature at any stage is limited to 150°C. Consider the index for polytropic compression as 1.25 and perfect and optimum inter-cooling in between the stages. Neglect the effect of clearance. [7]