Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5668]-119

S.E. (Mech./Auto.) (Second Semester) EXAMINATION, 2019

APPLIED THERMODYNAMICS

(2015 PATTERN)

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

N.B. **:—** (*i*) Solve *four* quesitons. Question Nos. **1** *or* **2**, **3** *or* **4**, **5** *or* **6**, **7** *or* **8**.

(*ii*) All the *four* questions should be solved in one answer-book and attach extra supplements if required.

(*iii*) Neat diagrams must be drawn wherever necessary.

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

(*v*) Use of scientific calculator is allowed.

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

1. (*a*) Define the following engine nomenclature : [6]

(*i*) Cylinder Bore

(*ii*) Stroke

(*iii*) Displacement volume

(*iv*) Clearance volume

(*v*) Compression ratio

(*vi*) Cubic capacity.

P.T.O.

(*b*) Explain with figures any *three* types of combustion chambers used in SI engines. [6]

Or

2. (*a*) Explain the following losses associated the actual cycle (any *three*) : [6]

(*i*) Time loss

(*ii*) Rubbing friction loss

(*iii*) Exhaust blowdown loss

(*iv*) Pumping loss

(*v*) Direct heat loss.

(*b*) Describe briefly : [6]

(*i*) Factors affecting the process of carburation.

(*ii*) Rating of fuels in SI engines.

3. (*a*) Explain phenomenon of diesel knock. Compare it with the phenomenon of detonation in S.I. engines. [6]

(*b*) The following details were noted in a test on a 4-cylinder, 4-stroke engine, diameter = 100 mm; stroke = 120 mm; speed of the engine = 1600 rpm; fuel consumption = 0.2 kg/min; calorific value of fuel is 44000 kJ/kg; difference in tension on either side of the brake pulley = 40 kg; brake circumference is 300 cm. If the mechanical efficiency is 80%, Calculate :

(*i*) brake thermal efficiency

(*ii*) indicated thermal efficiency

(*iii*) indicated mean effective pressure

(*iv*) Brake specific fuel consumption. [6]

Or

4. (*a*) What is supercharging ? How is it achieved ? Explain it with P-V diagram. [6]

(*b*) During the trial of a single-cylinder, four-stroke oil engine, the following results were obtained : [6]

Cylinder diameter	= 20 cm
Stroke	= 40 cm
Mean effective pressure	= 6 bar
Torque	= 407 Nm
Speed	= 250 rpm
Oil consumption	= 4 kg/hr
Calorific value of fuel	= 43 MJ/kg
Cooling water flow rate	= 4.5 kg/min
Air used per kg of fuel	= 30 kg
Rise in cooling water temperature	= 45ºC
Temperature of exhaust gases	= 420 ºC
Room temperature	= 20ºC
Mean specific heat of exhaust gas	= 1 kJ/kg K
Specific heat of water	= 4.18 kJ/kg K

Find the IP, BP and draw up a heat balance sheet for the test in kJ/hr.

5. (*a*) With neat sketch, discuss the effect of A : F ratio on emission of : [6]

(*i*) Unburnt HC

(*ii*) CO

(*iii*) NOx.

(*b*) Draw neat labelled sketch of battery ignition system showing various components and briefly explain its working. [7]

Or

6. (*a*) With neat sketch explain splash lubrication system. [6]

(*b*) Write a short note on Emissions from S.I and C.I engines and their harmful effects. [7]

7. (*a*) Describe with a neat sketch, the working of a vane compressor. [6]

(*b*) A single stage reciprocating air compressor takes in 7.5 m^3/min of air at 1 bar and 30ºC and delivers it at 5 bar. The clearance is 5% of the stroke. The expansion and compression are polytropic, n = 1.3. Calculate : [7]

(*i*) the temperature of delivered air

(*ii*) volumetric efficiency

(*iii*) Power of the compressor.

Or

8. (*a*) Explain the following terms related to compressor : [6]

(*i*) Free air delivery

(*ii*) Capacity of compressor

(*iii*) Volumetric efficiency.

(*b*) A three stage compressor delivers air at 70 bar from an atmospheric pressure of 1 bar and 30ºC. Assuming the intercooling complete, estimate the amount of minimum work required to deal with 1 kg of air. Also find the amount of heat rejected in each intercooler. The index of compression is 1.2 throughout. Take Cp for air = 1.005 kJ/kg K. [7]