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[5057]-217

S.E. (Mechanical) (Second Semester) EXAMINATION, 2016

APPLIED THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours　　　　　　　　Maximum Marks : 50

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.

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

　　　(*iii*) Use of calculator is allowed.

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

1. (*a*) Draw and explain actual valve timing diagram for four stroke C.I. Engine. [6]

　　(*b*) Draw and explain with neat sketch simple carburetor. [6]

Or

2. (*a*) Explain pumping and friction losses and their effects on the power output of the engine. [6]

　　(*b*) Explain stage of combustion in SI engine with the help of P-Theta diagram. [6]

3. (*a*) Draw and explain working of automatic injector. [6]

P.T.O.

(*b*) The following data were recorded in a test one hour duration on a single cylinder oil engine working on a 4-stroke cycle : [6]

Bore = 300 mm

Stroke = 450 mm

Average speed = 200 rpm

Brake friction load = 1860 N

Fuel used = 8.8 kg

Calorific value of fuel = 41800 kJ/kg

Mean effective pressure (m.e.p.) = 5.8 bar

Quantity of cooling water = 650 kg

Temperature rise = 22°C

Diameter of the brake wheel = 1.22 m

Determine :

(*i*) Mechanical efficiency

(*ii*) Brake thermal efficiency

(*iii*) Draw heat balance sheet on kW basis.

Or

4. (*a*) Compare abnormal combustion in SI and CI engine. [6]

(*b*) The following details were noted in a test on a four-cylinder, four-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 : [6]

(i) Brake thermal efficiency

(ii) Indicated thermal efficiency

(iii) Indicated mean effective pressure

(iv) Brake specific fuel consumption.

5. (a) Enlist and discuss briefly various types of exhaust emissions from an automobile. [6]

(b) Enlist types of lubrication system and explain with neat sketch dry sump lubrication system. [7]

Or

6. (a) Explain catalytic converter used in S.I. engines. [6]

(b) What is thermostat ? Draw a neat sketch of Thermostat cooling system and explain its working. [7]

7. (a) Explain Vane type of compressor with a neat sketch. [6]

(b) A single cylinder, single acting air compressor delivers 10 kg of air per minute. The air is compressed from 1 bar and 27 deg. C to 6 bars. The compression process follows the law $PV^{1.25}$ = C. Find : [7]

(i) Work done

(ii) Brake power required if mechanical efficiency is 80%.

Or

8. (*a*) Write down the advantages of Multi staging in reciprocating air compressor. [6]

(*b*) A 2-stage single acting air compressor takes in air at 1 bar and 300 K. Air is discharged at 10 bar. The intermediate pressure is ideal and intercooling is perfect. The law of compression is $PV^{1.3}$ = C Rate of discharge is 0.1 kg/sec, find : [7]

(*i*) Power required to drive the compressor

(*ii*) Saving in work compared to single-stage

(*iii*) Isothermal efficiency for single and multistage.

Take CP = 1 kJ/kgK, R = 0.287 kJ/kgK.