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[5252]-519

S.E. (Mechanical/Automobile) (Second Semester)

EXAMINATION, 2017

APPLIED THERMODYNAMICS

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer 4 questions out of 8.

(ii) Solve Q. 1 or Q. 2, Q. 3 or Q. 4., Q. 5. or Q. 6,
Q. 7 or Q. 8.

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

(iv) Draw diagrams wherever necessary.

(v) Use of scientific calculator is allowed.

(vi) Assume suitable data wherever necessary.

1. (a) Explain the phenomenon of Dissociation and show its effects
on Otto cycle. [6]
- (b) Describe stages of combustion in SI engine with the help of
P- θ diagram. [6]

Or

2. (a) Draw and explain valve timing diagram for 4-stroke petrol
engine. [6]
- (b) Explain the simple carburetor with neat sketch. List out the
limitations of simple carburetor. [6]
3. (a) Explain briefly different variables which affect knocking in C.I.
engine. [6]

P.T.O.

- (b) During trial on single cylinder 4-S oil engine, the following results were obtained : [6]

Cylinder diameter = 20 cm, Stroke = 40 cm

Mean effective pressure = 6 bar

Torque = 407 N-m, Speed = 250 rpm

Oil consumption = 4 kg/hr

Calorific value of fuel = 43 MJ/kg

Cooling water flow rate = 270 kg/h

Rise in cooling water temperature = 45°C

Temperature of exhaust gases = 420°C

Room temperature = 20°C

Air used per kg of fuel = 30 kg

Mass flow rate of water through exhaust gas calorimeter = 8 kg/min

Rise in temperature of calorimeter water = 8°C

Mean specific heat of exhaust gas = 1kJ/kgK

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

Or

4. (a) With the help of neat sketch explain the working of automatic fuel injector. [6]
- (b) A six cylinder 4S, SI engine running at 4000 rpm. The bore of each cylinder is 100 mm and stroke is 120 mm. The clearance volume of each cylinder is 100 cc. The fuel consumption is 20 kg/hr and torque develop is 150 Nm.

Calculate : [6]

(i) BP

(ii) BMEP

(iii) Break thermal efficiency,

(iv) Relative efficiency based on brake power.

Assume calorific value of fuel as 43 MJ/kg.

5. (a) Write short notes on dry sump lubrication system. [6]
(b) What is air pollution ? Explain the contributors to air pollution and their harmful effects on human beings. [7]

Or

6. (a) What is the cause of NO_x generation ? Briefly explain various methods to control No_x. [6]
(b) What are the harmful effects of overheating of I.C. engines ? Explain any *one* cooling system with schematic sketch. [7]
7. (a) What is multistaging in reciprocating air compressor ? Explain its advantages with P-V diagram. [6]
(b) A single cylinder, double acting air compressor sucks in air at the rate of 5 m³/min at a pressure of 100 kPa and 25°C. It delivers air to the receiver at a pressure of 6 bar. The speed of the compressor is 250 rpm and stroke is 1.5 times cylinder diameter. Neglect the effect of clearance and if law of compression is $PV^{1.28} = C$,
find :
(i) Cylinder dimensions
(ii) Indicated power of the compressor
(iii) The shaft power if the mechanical efficiency is 90%. [7]

Or

8. (a) Explain vane type rotary compressor with neat sketch and P-V diagram. [6]
(b) Derive the expression for volumetric efficiency and enlist the various factors affecting volumetric efficiency. [7]