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[4857]-1018

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

EXAMINATION, 2015

APPLIED THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :- (i) Answer *four* questions out of 8.

(ii) Solve 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.

(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) Draw ideal and actual valve timing diagram (VTD) for four stroke S.I. Engine and state the reason for providing the deviation in timing in actual VTD. [6]

(b) Draw neat labelled diagram of ideal and actual combustion curve (on P-theta diagram) in S.I. Engines. [6]

Or

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

(i) Time loss

P.T.O.

- (ii) Direct heat loss
 - (iii) Exhaust blow down loss
 - (iv) Pumping loss
 - (v) Rubbing friction loss.
- (b) Explain the mixture requirements with necessary graphs : [6]
- (i) For steady state operation
 - (ii) For transient conditions.
3. (a) What are the different factors affecting delay period in C.I. Engine ? [6]
- (b) A six cylinder petrol engine operates on four-stroke cycle with the following parameters : [6]
- Cylinder bore = 70 mm
 - Piston stroke = 100 mm
 - Clearance volume per cylinder = 67 cm^3
 - Engine speed = 3960 rpm
 - Fuel consumption = 19.5 kg/h
 - Torque developed = 140 N-m
- Calculate :
- (i) The brake power
 - (ii) Brake thermal efficiency if CV of the fuel is 44000 kJ/kg and
 - (iii) The relative efficiency.

Or

4. (a) Draw different types of combustion chambers used in C.I. Engines. [6]

- (b) A full load test on a two-stroke engine yielded the following results : [6]

Engine Speed = 450 rev/min,

Brake load = 450 N,

Brake drum diameter = 1.5 m,

Rise in temperature of cooling water 36 deg. C,

Cooling water flow rate = 440 kg/hr,

Mass of fuel burnt = 5.4 kg/hr,

Mass of flue gases discharged = 172.8 kg/hr,

Temperature of exhaust gases = 355 deg. C,

Temperature of laboratory = 20 deg.

Engine specification :

Cylinder diameter = 22 cm,

Piston stroke = 27 cm,

CV of fuel = 44000 kJ/kg.

Draw the heat balance sheet for the test on % basis.

C_p for water = 4.18 kJ/kg K,

C_p for flue gases = 1.005 kJ/kg K.

5. (a) Draw neat labelled sketch of battery ignition system showing various components and briefly explain its working. [7]
- (b) Draw neat labelled sketch of Pressurized wet sump lubrication system and in short explain its working and different components lubricated. [6]

Or

6. (a) What is the necessity of cooling in I.C. Engines ? Explain with neat labelled sketch pressurized thermostatic water cooling system used in engines. [7]
- (b) Explain with neat sketch EGR system for controlling NOx. [6]

7. (a) Explain roots blower compressor with neat sketch. [6]
- (b) A single cylinder air compressor delivers 9 kg of air per minute. The air is compressed from 1 bar and 27 deg. C to 7 bar. The compression process follows the law $PV^{1.25} = C$. Find
- (i) Work done,
- (ii) Brake power required if mechanical efficiency is 85%. [7]

Or

8. (a) What are the advantages of multi-staging in reciprocating air compressor. [6]
- (b) During an experiment on a reciprocating air compressor the following observations were made :
- Barometer reading = 75.6 cm of Hg, Manometer reading across the orifice = 13 cm of Hg, atmospheric temperature = 25 deg. C, Diameter of orifice = 15 cm, Coefficient of discharge across the orifice = 0.65, Density of Hg = $0.0135951 \text{ kg/cm}^3$. Determine the volume of free air handled by the compressor. [7]