

UNIVERSITY OF PUNE
[4362]-117
S. E. (Mech.) Examination-2013
I.C. Engine
(2008 Course)

Total No. Of Questions: 12

[Total No. Of Printed Pages: 5]

[Time: 3 Hours]

[Max. Marks: 100]

Instructions:

- (1) Answer any **three questions** from each section.
- (2) Answers to the **two sections** should be written in **separate answer-books**.
- (3) Black figures to the right indicate full marks.
- (4) Neat diagrams must be drawn wherever necessary.
- (5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (6) Assume suitable data, if necessary.

SECTION-I

Q. 1. A) Compare Otto, and Dual cycle for: (8)

- i. Constant maximum pressure and same heat input
- ii. Same compression ratio and same heat input
- iii. Same max pressure and same output

B) A S.I. engine working on Otto cycle takes the air in at 0.97 bar (10)

and 40°C. The compression ratio of the cycle is 7. The heat supplied during the cycle is 1.2 MJ/kg of working fluid. Find:

- i. Air standard efficiency of the cycle
- ii. Maximum temperature attained in the cycle
- iii. Maximum pressure attained in the cycle
- iv. Work done per kg of working fluid

v. Mean effective pressure

Take $\gamma=1.4$, $C_v=720\text{J/kg-k}$

OR

Q. 2. A) Derive an expression for thermal efficiency of a diesel cycle with usual notation. (8)

B) Explain pumping and friction losses and their effects on the power Output of the engine. (5)

C) State the assumption made for air standard cycle. (5)

Q. 3. A) Explain with neat sketch the following systems of a carburetor (7)

i. Idling system

ii. Chock

B) The diameter for a venture of a simple carburetor is 2cm and its $C_{da}=0.85$. The fuel nozzle diameter is 1.25 mm and $C_{df}=0.66$. (9)

The lip of the fuel nozzle is 5 mm. Find:

i. A:F ratio for pressure drop of 0.07 bar when nozzle lip is neglected.

ii. A:F ratio when the nozzle lip is considered.

iii. The minimum velocity of air required to start the fuel flow when lip Provided.

Take density of air = 1.2 kg/m^3 and density of fluid= 750 kg/m^3 .

OR

Q. 4. A) Explain the basic requirements of a good combustion chamber of S.I. engine and draw a neat sketch of T-head combustion chamber. (8)

B) Explain the phenomenon of pre-ignition. How pre-ignition leads to detonation and vice-versa? Explain how pre-ignition can be detected? (8)

Q. 5.A) How air-less injection systems are classified? Explain the working of distributor system with the help of neat sketch. Discuss their relative merits and demerits. (8)

B) What are the functions of a nozzle? Explain various types of nozzles With neat sketches. (8)

OR

Q. 6.A) Explain the stage of combustion in CI engine. (8)

B) What is meant by ignition delay? Explain the effect of following factors on the ignition delay with suitable reason. (8)

- i. Compression Ratio
- ii. Engine size
- iii. Engine speed

SECTION-II

Q. 7. A) What are the basic requirements of an ideal ignition system? (4)

B) What are the desirable properties of good lubricating oil? (4)

C) What are the main functions of lubricating system? Explain dry Sump lubricating system. (8)

OR

Q. 8.A) Define the functions of radiators. Discuss different type of matrices used with these radiators with neat sketch. (8)

B) Explain the working of spring loaded mechanical governor with the help of neat sketch used for Diesel engine. (8)

Q. 9. A) The following observations are made during a trial on an oil engine (12)

- Motor power to start the engine = 10kW
- R.P.M.=1750
- Brake Torque = 327.5Nm
- Fuel used = 15 kg/hr
- C.V. of fuel used = 42MJ/kg
- Air supplied = 4.75 kg/min
- Quantity of cooling water = 16 kg/min
- Outlet temperature of cooling water = 65.8°C
- Room temperature = 20.8°C
- Exhaust gas temperature = 400°C
- Take $C_{pw} = 4.2 \text{ kJ/kg. K}$ and $C_{pg} = 1.25 \text{ kJ/kg.K}$

Determine :

- i. B.P.
- ii. Mechanical efficiency
- iii. BSFC
- iv. Draw a neat balance sheet on k W basis and percentage basis.

B) Write a short note on: (6)

- i. Heat balance sheet.
- ii. Various factors affecting volumetric efficiency.

OR

Q. 10. A) A six cylinder gasoline engine operates on the four stroke cycle. (10)

The bore of each cylinder is 80 mm and stroke 100 mm. the clearance

Volume per cylinder is 70CC. At a speed of 4000 r.p.m., the fuel

Consumption is 30 kg/hr. and the torque developed is 150 N.m

Calculate:

- i. The brake power
- ii. The brake mean effective pressure
- iii. The brake mean thermal efficiency

Assume the C.V. of fuel as 43,000 kJ/kg. Also estimate relative efficiency

When engine works on constant volume cycle with $\gamma = 1.4$ for air.

B) What is the dynamometer? Name the various types of dynamometer. (8)

Explain the Eddy current dynamometer with the help of a neat sketch.

Q. 11. A) Enlist the specification of an automobile engine. (6)

B) What is air pollution? Explain the contributors to air pollution and their harmful effects on humans beings. (6)

C) Mention the modifications required if hydrogen is used in SI engine (4)

As a substitute fuel. www.sppuonline.com

OR

Q. 12. Write short notes on: (16)

- i. Hybrid electric vehicle
- ii. Emission control methods for IC engines.
- iii. Exhaust gas recirculation.
- iv. Euro norms