J.C. BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY YMCA, FARIDABAD

B. TECH. 5TH SEMESTER MECHANICAL ENGINEERING (UNDER CBS)

INTERNAL COMBUSTION ENGINES (MU-305)

Time: 3 Hours | Max. Marks: 60

Note: 1. *It is compulsory to answer the questions of Part -1.*
2. *Answer any four questions from Part -2 in detail.*
3. *Different parts of the same question are to be attempted adjacent to each other.*
4. *Support your answer with neat sketches, wherever necessary.*

PART -1

Q1 (a) What are the assumptions made in air standard cycle analysis? (2)
(b) Why a rich mixture is required for maximum power? (2)
(c) What are the factors which affect the process of carburetion? (2)
(d) What is ignition lag? (2)
(e) What is meant by delay period? (2)
(f) Why is over-cooling in an engine harmful? (2)
(g) What are the various methods of measuring indicated power? (2)
(h) What are the main constituents of exhaust emission from petrol engines? (2)
(i) What do you understand by blending of fuels? (2)
(j) State the advantages of closed cycle gas turbine plant. (2)

PART -2

Q2 An oil engine takes in air at 1.01 bar, 20°C and maximum cycle pressure is 69 bar. The compression ratio is 18:1. Calculate the air standard efficiency and mean effective pressure based on the dual combustion cycle. Assume that heat added at constant volume is equal to the heat added at constant pressure. Take $c_p = 1.005$, $c_v = 0.718$ and $\gamma = 1.4$. (10)

Q3 (i) Discuss the requirements of a diesel injection system. (10)
(ii) What do you understand by ignition timing? Discuss the various factors which affect ignition timing requirements.

Q4 (i) Explain the phenomenon of pre-ignition? How pre-ignition leads to detonation and vice-versa? (10)
(ii) How C.I. engine combustion chambers are classified?

Q5 (i) Discuss wet sump lubrication system with the help of a suitable sketch. (10)
(ii) Compare the merits and demerits of air and water cooling systems.

Q6 The following data were recorded from a test on a single cylinder four-stroke oil engine. (10)
Cylinder bore = 150 mm, engine stroke = 250 mm, area of indicator diagram = 450 mm^2, length of indicator diagram = 50 mm, indicator spring rating = 1.2 mm, engine speed = 420 rpm, brake torque = 217 Nm, fuel consumption = 2.95 kg/h, calorific value of fuel = 44000 kJ/kg, cooling water rate of flow = 0.068 kg/s, cooling water temperature rise = 45K, specific heat capacity of the cooling water = 4.1868 kJ/kgK.
Calculate (a) the mechanical efficiency (b) the brake thermal efficiency (c) the specific fuel consumption, and (d) draw up the heat balance in kw.

Q7 Write short notes on the following: (10)
(i) Alternative fuels for I.C. Engines
(ii) Components of a gas turbine plant

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