

337653(37)BE (6th Semester)

Examination, April-May, 2018

(New Scheme)

Internal Combustion Engines

Time Allowed : 3 hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : (i) Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts from (b), (c) and (d).

(ii) The figures in the right-hand margin indicate marks.

1. (a) Show by suitable sketches the following type of cylinder arrangements : [2]

(i) Opposed piston engine

(ii) Radial engine

(b) Describe with a suitable sketch, the construction and working of two-stroke cycle SI engine, also draw indicator diagram and mark opening and closing positions of valves on it. [7]

(c) Assuming fuel-air cycle approximation, discuss the effects of fuel-air ratio on the following parameters of Otto cycle : [7]

(i) Efficiency

(ii) Maximum temperature

(iii) Maximum pressure

(iv) Power

(d) What is meant by 'Burning time loss'? Discuss the effect of spark advance on the efficiency of an Otto cycle engine with the help of $P-V$ diagram. What is optimum spark advance? [7]

2. (a) What is meant by 'Ignition limits'? What are the ignition limits for hydrocarbons? [2]

(b) Describe the phenomenon of detonation in SI engines. What are the four main factors which affect the tendency to detonate? Describe them fully. [7]

(c) Describe the stages of combustion in CI engines with the help of pressure-crank angle diagram and discuss the variable affecting delay period. [7]

(d) What is ASTM distillation curve? Discuss the effects of volatility on the following : [7]

(i) Carburetor icing

(ii) Crank-case dilution

3. (a) What is meant by 'stoichiometric air fuel ratio'? [2]
- (b) What is meant by 'Idling'? Explain why a rich mixture is required for idling. Describe with suitable sketch, idling system of modern carburetor. [7]
- (c) With the help of suitable graphs, explain how the power and efficiency of a SI engine varies with air-fuel ratio. Give justification for the same. [7]
- (d) A single jet carburetor is to supply 6kg/min of air and 0.4 kg/min of petrol of specific gravity 0.75, the air is initially of 1.013 bar and 27°C. Assuming an is entropic coefficient of 1.35 for air, determine—
- (i) the diameter of the venturi if the air speed is 90 m/s and the velocity coefficient for venturi is 0.85;
- (ii) the diameter of the jet if pressure drop at the jet is 0.8 times the pressure drop at the venturi and the discharge coefficient for the jet is 0.66. [7]
4. (a) Explain the terms : [2]
- (i) Hit and miss governing
- (ii) Quality governing
- (b) Describe with the help of neat sketches, the construction and working of a helix bypass fuel injection pump. [7]
- (c) Explain, why vacuum advance mechanism and centrifugal advance mechanism for

- ignition advance are required in ignition system. Describe its working principle with the help of neat sketches. [7]
- (d) Discuss the functions of lubrication system in an engine. What is mist lubrication system? [7]
5. (a) Define following terms : [2]
- (i) Indicated power
- (ii) Heat balance sheet
- (b) What are the various methods of measuring friction power? Describe the 'motoring method' of measurement of friction power. [7]
- (c) Sketch a typical variable speed test performance curve at full throttle of SI engine and comment on the nature of curve : [7]
- (i) torque vs speed
- (ii) bsfc vs speed
- (d) A four-stroke, four-cylinder gasoline engine has a bore of 60 mm and stroke of 100 mm. On a test engine develops a torque of 66.5 Nm when running at 3000 r.p.m. If the clearance volume in each cylinder is 60cc and the relative efficiency with respect to brake thermal efficiency is 50%, calculate the brake power and brake thermal efficiency. [7]