Enrollment No......................................

Faculty of Engineering
End Sem (Odd) Examination Dec-2017
AU3CO06 Automotive Engines

Programme: B.Tech.   Branch/Specialisation: AU

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated.

Q.1 i. If the air-fuel mixture in a spark ignition engine is too rich, then air-fuel ratio is about   **1**
(a) 17 : 1   (b) 15 : 1   (c) 13 : 1   (d) 10 : 1

ii. The motion of the cam is transferred to the valves through   **1**
(a) Pistons   (b) Camshaft pulley
(c) Rocker arms   (d) Valve stems

iii. The heat give to cooling medium in an IC engine is about   **1**
(a)50 – 60 %   (b) 30 – 40 % (c) 10 – 15 % (d) 60 – 70 %

iv. The principal surfaces requiring lubrication in an IC engine are   **1**
(a) Cylinder head   (b) Crank case
(c) Inlet and exhaust manifold(d) None of these

v. Combustion in compression ignition engines is   **1**
(a) Homogeneous   (b) Heterogeneous
(c) Laminar   (d) Turbulent.

vi. As a result of detonation in an I.C. engine, following parameter attains very high value   **1**
(a) Rate of rise of pressure   (b) Rate of rise of temperature
(c) Peak temperature   (d) Rate of rise of horse-power

vii. The mean effective pressure obtained from engine indicator indicates the   **1**
(a) Maximum pressure developed
(b) Minimum pressure
(c) Instantaneous pressure at a instant
(d) Average pressure

viii. Compared to engine driven supercharger the exhaust driven supercharger is **1**
(a) Easy to handle
(b) Utilizes the exhaust energy of engine
(c) Supplies more air
(d) Matching with engine is easy

ix. In case of rotating masses, the magnitude of the balancing mass is _____when the speed of the shaft is doubled. **1**
(a) Doubled   (b) Halved   (c) Unaffected (d) Quadrupled

x. Which statement of the following is correct? **1**
(a) If a rotor is dynamically balanced, it is also statically balanced.
(b) If a rotor is statically balanced, it is also dynamically balanced.
(c) If a rotor is dynamically balanced, it is may or may not be statically balanced.
(d) None of these.

Q.2 i. What is basic principal of carburetor? Define carburetion. **2**
ii. Draw dual cycle on p-v and T-s chart. Also obtain a relation for its thermal efficiency. **8**
OR iii. Mention different types of fuel supply system for CI engine and explain any one with help of diagram in detail. **8**

Q.3 i. Enlist any four types of liquid cooling system. **2**
ii. Explain and compare wet sump and dry sump lubrication systems. **8**
OR iii. Mention any six parameters which affect the engine heat transfer and explain their effect. **8**

Q.4 i. What is homogeneous and heterogeneous mixture? In which engine these are used? **2**
ii. Explain the phenomenon of detonation in CI engine and compare it with SI engine knocking. (at least six points) **8**
OR iii. What is delay period and what are factors that affect it? Explain. (at least four) **8**

Q.5 i. What do you understand by the term turbochrging? **2**
ii. A four-cylinder four stroke petrol engine has a bore of 57 mm and a stroke of 90 mm. Its rated speed is 2800 rpm, torque is 55.2 Nm. The **8**

fuel consumption is 6.74 lit/h. The density of petrol is 735 kg/m^3 and calorific value of 44,200 kJ/kg. Calculate brake power, brake mean effective pressure, brake thermal efficiency and brake specific fuel consumption.

OR iii. Define supercharging, enlist different types of same and explain any one in detail with the help of diagram. **8**

Q.6 Attempt any two :
i. Explain engine force analysis with the help of diagram and also derive the different forces for single slider crank mechanism. **5**

ii. The turning moment diagram of a four-stroke engine is assumed to be represented by four triangles, the area of which from the line zero pressure are: **5**
Suction stroke = 440 mm^2, Compression stroke = 1600 mm^2
Expansion stroke = 7200 mm^2 & Exhaust stroke = 660 mm^2
Each mm^2 of area represent 3 Nm of energy. If the resisting torque is uniform, determine the mass of the rim of a flywheel to keep the speed between 218 and 222 rpm when the mean radius of the rim is to be 1.25 m.

iii. A rotating shaft carries three unbalanced masses of 4 kg, 3 kg and 2.5 kg at radial distances of 75 mm, 85 mm and 50 mm and at the angular positions of 45°, 135° and 240° respectively. The second and third masses are in planes at 200 mm and 375 mm from plane of first mass. The angular positions are measured counter clockwise from the reference line along x-axis and viewing the shaft from the first mass end. **5**
The shaft length is 800 mm between bearings and the distance between the plane of the first mass and the bearing at that end is 225 mm. Determine the amount of the counter masses in plane at 75 mm from the bearings for the complete balance of the shaft. The first counter mass is to be in plane between the first mass and the bearing at radial distance of 75 mm and the second mass in a plane between the third mass and the bearing at that end at a radial distance of 40 mm.

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Marking Scheme

Q.1 i.   (d) 10 : 1   **1**
     ii.   (c) Rocker arms   **1**
     iii. (b) 30 – 40 %   **1**
     iv.   (d) None of above   **1**
     v.   (b) Heterogeneous   **1**
     vi.   (a) Rate of rise of pressure   **1**
     vii. (d) Average pressure   **1**
     viii. (b) Utilizes the exhaust energy of engine   **1**
     ix.   (c) Unaffected   **1**
     x.   (a) If a rotor is dynamically balanced, it is also statically   **1**
           balanced

Q.2 i.   Basic principal……(1 marks)   **2**
           Carburetion……….(1 marks)
     ii.   Dual cycle on p-v   (2 marks)   **8**
           Dual cycle on T-s chart (2 marks)
           Derivation .... (4 marks)
OR   iii. Mention types.................................... (2 marks)   **8**
           Diagram of diesel supply system .... (2 marks)
           Explain.. (4 marks)

Q.3 i.   Four types (2 marks)   **2**
     ii.   Six parameter ....(2 marks)   **8**
           Explain.................. (6 marks) for at least 3 parameter
OR   iii. Explain with figure .... (4 marks)   **8**
           Comparison.................... (4marks)

Q.4 i.   Homogeneous and heterogeneous mixture...................(1 marks)   **2**
           In which engine... (1 marks)
     ii.   Explain the phenomenon with figure........(4 marks)   **8**
           Compare..............................(4 marks) (at least six points)
OR   iii. What is delay period........... (2 marks)   **8**
           What are factors................. (2 marks)
            Explain any four factors .... (4 marks)

Q.5 i.   Definition turbo charging.....(2 marks)   **2**
     ii.   For each correct answer give 2 marks (2 marks * 4 = 8 marks)   **8**
           BP = 16.18 kW
           P_{bm} = 7.55 bar
           m_f = 1.376 *10^{-3} kg/s
           η_{bth} = 26.6 %
           bSFC = 0.306 kg/kWh
OR   iii. Define supercharging.................................(2 marks)   **8**
           Enlist types... (2 marks)
           Explain with diagram & Construction.......... (4 marks)

Q.6 i.   Explain....... (1 marks)   **5**
           Derivation (4 marks)
     ii.   Turning moment dig................ (2 marks)   **5**
           T_{max} = 13751 Nm
           Max. Fluctuation of energy = e = 18356 Nm
           m = 1217.4 kg ....(3 marks)
OR   iii. Diagram (1 marks)   **5**
           m_{c1} = 3.14 kg at α = 253.2^o = 253° 12' ....(2 marks)
           m_{c2} = 2.868 kg at α = 329.3^o = 329° 18' ....(2 marks)