Paper Code: ME-505	**Roll No.**									

B.Tech.

FIFTH SEMESTER EXAMINATION, 2016-17

I.C. ENGINES & COMPRESSORS

[Time: 3 hrs.] [Max. Marks: 100]

Note: Attempt ***ALL*** questions. Assume suitable data, if required. All question carry equal marks.

1. Attempt any two of the following:- **(10x2=20)**

(a) Derive the expression for thermal efficiency of otto cycle in terms of compression ratio. A diesel engine having compression ratio 16 and cut off ratio of 2.53 operates on air standard cycle. The temperature and pressure of air at the beginning of compression is 27 °C and 1 bar. Find air fuel ratio. The calorific value of fuel is 42 MJ/kg.

(b) Answer the following

(i) Discuss the effect of spark advance on the performance of otto cycle. Show the effect of deviating spark timing on relative indicated mean effective pressure.

(ii) Make comparison between 2 stroke and 4 stroke engine.

(c) Answer the following

(i) Compare otto and diesel cycle for same peak pressure and peak temperature with the help of P-v and T-s chart.

(ii) For fuel air cycle, show how equivalence ratio affect efficiency, power and temperature in a cycle.

2. Attempt any two of the following:- **(10x2=20)**

(a) An engine has a simple carburetor with single jet. Petrol is 3 mm below the nozzle opening with engine not running. conditions of air are 288.5 K and 100.75 kPa. The specific gravity of fuel in 0.70. The engine consumes 6.36 kg of fuel per hour. The jet has a diameter of 1.27 mm. The nozzle discharge coefficient is 0.6. Discharge coefficient of air = 0.8, Fuel air ratio= 0.066. Find air velocity and throat diameter of venturi. What is the drop in the pressure in the venturi, expressed in mm of water. Neglect compressibility effect of air.

(b) Give a neat sketch of battery ignition system of petrol engine and explain its working.

(c) Discuss the phenomenon of knocking in SI Engine. Also discuss the effect of compression ratio, spark timing, engine speed and engine load on detonation in SI engine.

3. Attempt any two of the following:- **(10x2=20)**

(a) Explain the process of diesel injection by (i) air injection and (ii) solid injection

(b) Answer the following

(i) Draw valve timing diagram of 4-stroke SI engine. A four stroke diesel engine is operating at 2400 rpm. Fuel injection starts at 20° before TDC and ends at 5° after TDC. If the quantity of fuel injected in a cycle is 40 mg. Find the fuel injection rate in kg/s.

(ii) Discuss the causes of HC emissions from SI engine.

(c) Define ignition delay period. Discuss the effect of cetane no., injection timing, injection pressure, engine speed, air fuel ratio, compression ratio on ignition delay.

4. Attempt any two of the following:- **(10x2=20)**

(a) Answer the following.

(i) Sketch and explain forced circulation type water cooling system.

(ii) Explain the dry sump lubrication system with neat sketch.

(b) Define cetane no. and octane no.. An old car has an engine with a carburetor adjusted to supply stoichiometric air-fuel supply at normal condition using gasoline (C8H15) as fuel. Calculate the actual equivalence ratio the carburetor is supplying to the engine when it is supplied with the M20 (20% blend of methanol in petrol) fuel.

(c) The air flow to a four cylinder four stroke oil engine is measured by means of a 5 cm diameter orifice, having a coefficient of discharge of 0.6. During the test on the engine following data were recorded:

Bore = 10.5 cm; stroke = 12.5 cm; Engine speed = 1200 rpm; brake torque = 147 Nm; fuel consumption is 5.5 kg/hr; calorific value of fuel = 43 MJ/kg; density of fuel is 831 kg/m ^{3}; pressure drop across orifice = 5.7 cm of water; ambient temperature and pressure were 20 °C and 1 bar respectively. Find, Brake thermal efficiency, brake mean effective pressure, brake specific fuel consumption and volumetric efficiency of the engine.

5. Attempt any two of the following: - **(10x2=20)**

(a) A three-stage, single acting, and reciprocating air compressor has a low pressure cylinder of 450 mm bore and 300 mm stroke. The clearance volume of law pressure cylinder is 5 percent of swept volume. Intake pressure and temperature are 1 bar and 18˚C respectively, the final delivery pressure is 15 bar. Intermediate pressures are ideal and inter-cooling is perfect. The compression and expansion index can be taken as 1.3. Determine (i) Intermediate pressures (ii) Effective swept volume of low pressure cylinder. (iii) The temperature and the volume of air delivered per stroke at 15 bar (iv) The work done per kg of air. Take R=0.29 kJ/kg.K

(b) Explain with a neat sketch working of vane type blower. Draw P-v diagram and provide expression for work done.

(c) Sketch & label various parts of centrifugal compression. Derive expression for Euler's work.