UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Programme Name: B. Tech Mechanical Engineering   Semester   : VII
Course Name   : IC Engines   Time   : 03 hrs
Course Code   : MEAD3005P   Max. Marks: 100

	SECTION A		5Qx 4M = 20 Marks

		Marks	**COs**
Q1.	Discuss the differences between CI engines and SI engines	4	**CO1**
Q2.	Explain working of pintaux nozzle and discuss its merits and demerits	4	**CO1**
Q3.	Explain why rich mixture is required for the following (a) Idling (b) maximum power	4	**CO2**
Q4.	Classify the internal combustion engines	4	**CO2**
Q5.	Describe in detail the causes of hydrocarbon emissions from SI engines	4	**CO1**

	SECTION B		**4Q x10 M=40 Marks**
Q6.	Bring out clearly the process of combustion in CI engines and explain the various stages of combustion.	10	**CO3**
Q7.	A 4 cylinder 4 stroke SI engine has a bore of 5.7cm and stroke 9cm. Its rated speed is 2800 RPM and it is tested at this speed against a brake, which has a torque arm of 356mm. The net brake load is 155N and fuel consumption is 6.74 lit/hr. Sp gravity of petrol is 0.735 and CV is 44200kJ/kg. A Morse test is carried out and cylinders are cut off in order of 1, 2, 3 & 4 with corresponding brake loads of 111, 106.5, 104.2 and 111N. Determine engine torque, bmep, brake thermal efficiency, sfc, mechanical efficiency and imep.	10	**CO2**
Q8.	Draw a schematic diagram of fuel feed pump and explain its working principle.	10	**CO3**
Q9.	Explain the phenomenon of knock in SI Engines and compare it with CI engine knock. **OR** Explain evaporation loss control device (ELCD) with neat sketch.	10	**CO3**

SECTION C		2Q x20 M=40 M
Q10.	(a) A six cylinder, four-stroke diesel engine has bore 360 mm and stroke 500 mm. A trail on the engine provided the following data: Mean area of indicator diagram = 780 mm^2; Length of the indicator diagram = 75 mm; Spring number = 0.7 bar per mm of compression; Brake torque = 14000 N-m; Speed = 500 rpm; Fuel consumption = 240 kg/h; Calorific value of fuel oil = 44000 kJ/kg ; Jacket cooling water = 320 kg/min; Rise in temperature of cooling water = 40^{0}C; Piston cooling Oil = 140 kg/min; Specific heat= 2.1kJ/kg K. Temperature raise of oil = 28 ^{0}C; Circulating water in gas calorimeter =300 kg/min; Rise in temperature of this water = 42 ^{0}C. All heat of the exhaust gases is absorbed in the calorimeter. Estimate the specific fuel consumption and mechanical efficiency of the engine. Draw up a heat balance sheet of the engine on 1 kg of fuel oil basis. (b) With Pressure and volume sketches explain the working principle of four-stroke compression ignition engine.	15+5 CO4
Q11.	(a) Discuss advantages and dis advantages of alcohol as a fuel for IC Engines. (b) A four-stroke petrol engine delivers a brake power of 36.8 kW with a mechanical efficiency 80 %. The air fuel ratio is 15:1 and the fuel consumption is 0.4068 kg/k W h. The heating value of the fuel is 42 000 kJ/kg. Calculate (i) indicated power (ii) frictional power (iii) brake thermal efficiency (iv) indicated thermal efficiency (v) total fuel consumption (vi) air consumption /second. (c) Explain rating of SI and CI Engine fuels. **OR** (d) Explain simple carburetor and their limits. (e) Explain any two indirect injection chambers for CI Engines with neat sketch. (f) A gasoline engine working on four stroke develops a brake power of 20.9 k W. A Morse Test was conducted on this engine and the brake power (kW) obtained when each cylinder was made in operative by short-circuiting the spark plug are 14.9, 14.3, 14.8 and 14.5 respectively. The test was conducted at constant speed. Find the indicated power, mechanical efficiency and bmep when all the cylinders are firing. The bore of the engine is 75 mm and the stroke is 90 mm. The engine is running at 3000 rpm.	5+10+5 CO4 5+5+10