

University of Mumbai

Examinations Summer 2022

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Subject:- Internal Combustion Engines

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Air enters a diesel engine with a density of 1.0 kg/m^3 . The compression ratio is 21. At steady state, the air intake is $30 \times 10^{-3} \text{ kg/s}$ and the net work output is 15 kW. The mean effective pressure (in kPa) is _____.
Option A:	625
Option B:	525
Option C:	535
Option D:	520
2.	Ignition quality of petrol is expressed by
Option A:	Cetane number
Option B:	Octane number
Option C:	Self-ignition temperature
Option D:	Calorific value
3.	Ignition timing of a multi-cylinder SI engine can be adjusted by
Option A:	Adjusting the pump pulley
Option B:	Rotating the cam shaft
Option C:	Adjusting the generator pulley
Option D:	Rotating the distributor
4.	The tendency of knocking in CI engine reduces by
Option A:	High self ignition temperature of fuel
Option B:	Decrease in injection pressure
Option C:	Injection of fuel just before TDC
Option D:	Decrease in jacket water temperature
5.	which of the following oil is multi-grade oil
Option A:	SAE10W30
Option B:	SAE25
Option C:	SAE10
Option D:	SAE20W
6.	In a morse test for a 2 cylinder, 2 Stroke SI engine, the brake power was 9 kW. Whereas the brake power of individual cylinders with spark cut off were 4.25 kW and 3.75 kW. The mechanical efficiency of the engine is
Option A:	90%
Option B:	80%
Option C:	45.5%
Option D:	52.5%
7.	Paraffins are generally represented by

Option A:	C_nH_n
Option B:	C_nH_{2n+2}
Option C:	C_nH_{2n}
Option D:	C_nH_{2n-6}
8.	In _____ sensor, output voltage changes in proportion to air-fuel ratio.
Option A:	Air inlet temperature
Option B:	Engine temperature
Option C:	Exhaust gas
Option D:	Air flow
9.	An engine produces 10 kW brake power while working with a brake thermal efficiency of 30%. If the calorific value of the fuel used is 40000 kJ/kg, then what is the fuel consumption?
Option A:	3 kg/hour
Option B:	1.5 kg/hour
Option C:	1 kg/hour
Option D:	0.3 kg/hour
10.	Which type of lubrication system is used in 2 stroke engine.
Option A:	Wet sump lubrication
Option B:	Mist lubrication system
Option C:	Dry sump lubrication
Option D:	Splash lubrication

Q2.	Solve any Four out of Six (20 Marks Each)
A	With a help of neat sketch explain catalytic convertor.
B	Define pour point & flash point and discuss its importance in selecting lubricating oil for i.c. engine.
C	Write short note on HCCI Engine.
D	Describe construction and working of thermosyphon cooling system with the help of Sketch.
E	State the reasons for efficiency of actual cycle is much lower than the air standard cycle efficiency? List the major losses.
F	Give brief account of exhaust oxygen sensor.

Q3.	Solve any Two Questions out of Three (20 Marks Each)
A	An 8 cylinder 4 stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 rpm on a dynamo-meter which has 54 cm arm. During a 10 minutes test the dynamo-meter scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air at 1 bar and 27°C was supplied to the carburetor at the rate of 6 kg/min. Determine (i) brake power, (ii) brake mean effective pressure, (iii) brake specific fuel consumption, (iv) brake specific air consumption, (v) brake thermal efficiency, (vi) volumetric efficiency and (vii) air fuel ratio.
B	Calculate the diameter of fuel orifice of 4 stroke engine which develops 25 kW per cylinder at 2500 rpm. The specific fuel consumption is 0.3 kg/kW h and fuel is injected at a pressure of 150 bar over a crank travel of 25°. The pressure in the combustion chamber is 40 bar. Coefficient of velocity is 0.875 and specific gravity is 0.8762.
C	Draw & explain the stages of combustion in S.I engine & the effect of various engine parameters on combustion.

Q4.	
A	Solve any Two (10 marks)
i.	Describe the phenomenon of knocking in S.I engine with the help of p-0 and p-v plots.
ii.	Write short note on alternative fuels for IC engine.
iii.	Explain why a rich mixture is required for Idling and sudden acceleration.
B	Solve any One (10 marks)
i.	During a test on a 4 stroke oil engine, the following data were obtained: Mean height of indicator diagram = 21mm; Indicator spring number/stiffness=27kN/m ² /mm; Swept volume=14 lit, effective brake load=77kg, Effective brake radius= 0.7m, speed=6.6 rev/s, fuel consumption=0.002kg/s, CV of fuel=44MJ/kg, Cooling water rate=0.15kg/s, water inlet temp=38°C, cooling water outlet temp=71°C, Sp. heat of water= 4.18kJ/kgK, energy carried by exhaust gases=33.6kJ/s. Determine IP, BP and mech efficiency and draw up heat balance sheet in kJ/s and %.
ii.	Describe the CRDI System with neat sketch and state its advantages and disadvantages.