Registration No : | | | | | | | | | | |

Total Number of Pages : 02

Course: B.Tech
Sub Code: PME41103

4th Semester Back Examination: 2022-23
SUBJECT: I C Engine and Gas Turbine
BRANCH(S): Mechanical
Time : 3 Hour
Max Marks : 100
Q.Code : M423

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Classify internal combustion engine according to method of ignition.
b) Define the term piston speed.
c) Mention the various assumptions made in air-standard cycle analysis.
d) What is the use of fuel-air cycle?
e) Define the term octane number.
f) What are the functional requirements of an injection system?
g) Discuss the basic requirements of a spark ignition system.
h) Why fins and baffles are required in an air-cooled engine? Explain.
i) Draw the p-v and T-s diagram of a simple gas turbine.
j) Discuss the basic principles of stratified engine.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) In an Otto cycle, air at 17°C and 1 bar is compressed adiabatically until the pressure is 15 bar. Heat is added at constant volume until the pressure rises to 40 bar. Calculate the air-standard efficiency, the compression ratio and the mean effective pressure for the cycle. Assume C_v = 0.717 kJ/kg K and R = 8.314 kJ/kmol K.
b) Determine the ideal efficiency of the diesel engine having a cylinder with bore 250 mm, stroke 375 mm and a clearance volume of 1500 cc, with fuel cut-off occurring at 5% of the stroke. Assume γ = 1.4 for air.
c) Briefly discuss about the properties important for a good diesel fuel.
d) What is meant by carburetion? What are the factors which affect the process of carburetion?
e) Describe air injection system with suitable diagram and discuss its advantages and disadvantages.
f) Describe different types of injection nozzles and discuss their relative advantages and disadvantages.
g) Describe few important factors affecting ignition timing.
h) Discuss important properties of lubricating oil.

i) Discuss the functions of lubricant in an engine.

j) Discuss the effect of supercharging on performance of the engine.

k) What are catalytic converters? How do they help in reducing HC, CO and NOx emissions?

l) Describe the parameters affecting engine heat transfer.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Describe with suitable sketches the combustion phenomenon in SI engines, and explain the two phases of combustion. **(16)**

Q4 What is meant by delay period? What is the importance of delay period? Discuss the variables affecting the delay period. **(16)**

Q5 The air flow to a four cylinder four stroke petrol engine is measured by means of a 7.5 cm diameter sharp edged orifice, C_d = 0.6. During a test on the engines the following data were recorded: **(16)**

Bore = 11 cm, stroke = 13 cm, engine speed = 2250 rev/in, brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value of fuel = 42000 kJ/kg, pressure drop across the orifice = 4.1 cm of water. Atmospheric temperature and pressure are 15^{o}C and 1.013 br.

Calculate:

1. Thermal efficiency on b.p basis.
2. Brake mean effective pressure.
3. Volumetric efficiency based on free air conditions

Q6 In an open cycle gas turbine plant air enters the compressor at 27^{o}C and 1 bar and leaves it at a pressure of 4.5 bar. The maximum temperature is 950^{o}C. The pressure drop in the combustion chamber is 0.15 bar. The efficiency of both compressor and turbine is 85%. Assuming constant specific heats of the fluid, find per kg of air (a) the network output and (b) the thermal efficiency of the plant. **(16)**