

IV B.Tech. II Semester Supplementary Examinations, July -2005
IC ENGINES
(Mechanical Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Discuss the ideal requirements of scavenging.
(b) Which method of scavenging is best from these considerations, with the necessary reasoning and explain its working.
2. (a) Explain what you understand by flame speed and what is it made up of.
(b) Why is flame speed important in combustion of s.i.engines.
3. (a) How the power and efficiency of the S.I.engine vary with air-fuel ratio for different load and speed conditions.
(b) Explain the following
 - i. Rich mixture
 - ii. Lean mixture
4. (a) What are the requirement of a combustion chamber for diesel engines?
(b) Explain the Air cell chamber in case of CI engines.
5. A four stroke diesel engine is pressure charged by using the energy of the exhaust gases to drive a turbo blower. The turbine and the blower have an adiabatic efficiency of 75%. Air from the atmosphere at 1 bar and 27⁰C is compressed in steady flow through the blower to 1.75 bar and after cooled to 30⁰C when the air enters the cylinder. The volumetric compression of the engine is 15, the peak pressure is limited to 100 bar and 1350 kJ of energy are librated per kg cylinder air. Release occurs at bottom dead center at constant cylinder voume, the exhaust gas passing through the turbine to atmospheric while the piston is at the botton dead center and remains throughout the exhaust stroke. The effects of clearence may be neglected. Assuming air cycle and neglecting heat, pressure and frictional losses in the engine, calculate othe maximum system excess work available from the supercharger.
6. (a) List the parameters by which performance of an engine is evaluated ?
(b) A single cylinder oil engine has a compression ratio of 8 to 1. The specific fuel consumption is 0.5 kg/ kWh. The Calorific value of fuel is 4400 kJ/kg. Calculate.
 - i. The thermal efficiency and
 - ii. the relative efficiencyAssume the engine is working on constant volume cycle and ratio of specific heats as 1.4

7. (a) What are modifications to be made to convert an existing engine to operate on lean mixture?
(b) What is stratified charge engine?
8. What is meant by Vapour locking and by what means vapour lock tendency can be reduced?

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1. Explain clearly what you understand by thermodynamic cycle and working cycle and their inter-dependence and importance with examples.
2. (a) What do you understand by ignition delay in S. I. engine combustion.
(b) Explain flame velocity and the effect of the speed of engine operation on it.
3. Bring out with logical explanation the additional requirements.
4. Explain 'M' Combustion chamber. List its advantages.
5. (a) What is meant by pulse turbocharging? What are its advantages and disadvantages.
(b) What is a 'pulse converter'? What are its merits and demerits?
6. A four – stroke gas engine having a cylinder of 250 mm diameter and 450mm stroke has a volumetric efficiency η_v of 80%, The ratio of air to gas is 8 to 1, the calorific value of gas is $20,000 \text{ J/m}^3$ at NTP. Find the heat supplied to the engine per working cycle. If the compression ratio is 5, what is the heating value of the mixture per working stroke per m^3 of total cylinder volume.
7. (a) Indicate how fuel supply system optimization could reduce exhaust emissions?
(b) What are the exhaust gases after treatments tried to reduce pollutants?
8. (a) What is highest useful compression ratio and explain critical compression ratio for SI engine ?
(b) what is the permissible compression ratio in SI engines?

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1. (a) Why do you need ignition in i.c. engines? Discuss the types of ignition employed.
(b) Explain any method of fuel introduction with a neat schematic.
2. (a) Explain what you understand by flame speed and what is it made up of.
(b) Why is flame speed important in combustion of s.i.engines.
3. Describe with a neat sketch each of the following systems of a modern carburetor.
 - (a) Idling system
 - (b) Economizer
 - (c) Acceleration system
4. Factors tending to increase detonation in SI engines tend to reduce knock in CI engines. Discuss the validity of the above statement in the light of the differences in the nature of the two phenomenon and indicate the methods used to reduce knock in CI engines.
5. (a) Describe the exhaust pipe arrangement for turbocharged engines having different number of cylinders.
(b) What are the merits and demerits of constant pressure turbo charging.
6. In a test of a four –cylinder, four- stroke engine of 75 mm bore and 100 mm stroke, the following results were obtained at full throttle at a constant speed and with a fixed setting of the fuel supply of 0.082kg/min.
Brake horse power with all cylinders working – 15.24 kW
With first cylinder cut- off – 10.45 kW
With second cylinder cut- off – 10.38 kW
With third cylinder cut- off – 10.23 kW
With fourth cylinder cut- off – 10.45 kW
Estimate the indicated power of the engine under these conditions. If the calorific value of the fuel is 44000 J/kg, find the indicated thermal efficiency. Compare this with air standard efficiency, the clearance volume of the cylinder being 115 cc.
7. (a) What are advantages of stratified charge engine?
(b) What are the pollutants emitted by the CI engine exhaust?

- (c) What is smoke in exhaust gas?
8. Briefly explain the procedure for the production of gobar gas?

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1. Explain clearly what you understand by thermodynamic cycle and working cycle and their inter-dependence and importance with examples.
2. (a) How is flame speed a phenomenon of S.I engine combustion only. Explain.
(b) How do engine operating variables influence flame speed.
3. (a) Explain how the fuel quantity is metered according to the load requirement, in a carburetor.
(b) Why do you require a rich mix here in the power range of S.I.engine operation. Explain.
4. Explain with figures various types of combustion chambers used in CI engines.
5. (a) With a schematic diagram explain the working of two – stage turbocharged engine.
(b) What are the merits and demerits of the turbocharging.
6. (a) Explain the principle involved in the measurement of brake horse power.
(b) Discuss briefly the various methods for measuring the brake horse power.
7. (a) What are modifications to be made to convert an existing engine to operate on lean mixture?
(b) What is stratified charge engine?
8. (a) Indicate briefly the principle of operation of bio-gas or natural gas in SI engines?
(b) What is the pour point? Why it is important?
