

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK

Subject Name & Code:

Internal Combustion Engine- 3171923

Unit 1: Introduction to SI and CI Engines

Repeated Questions:

1. **Compare SI and CI engines.**
 - Appeared in: S25 (03), W23 (03), S24 (03), S22 (03), S23 (Classification in detail - 03)
2. **Enlist and explain applications of SI and CI engines.**
 - Appeared in: W23 (04)
3. **Compare properties of conventional fuels (Petrol/Diesel) with alternate/unconventional fuels.**
 - Appeared in: S25 (07), S24 (04), S22 (07)

Other Important Questions:

- Give classification of I.C. Engine in detail. (S23 - 03)
- Compare SI and CI engines based on initial and maintenance costs. (W23 - 03)
- Compare Petrol and Diesel engine on the basis of: Fuel Ignition, Thermal efficiency, Fuel supply. (W22 - 03)
- Explain compression ratio and clearance volume. (S23 - 04)
- Explain working of a four-stroke petrol engine. (S23 - 07)
- Discuss important qualities of IC engine fuels. (W23 - 07)
- What are the desirable properties of IC engine fuels? (W22 - 04)

Unit 2: Fuels and Supply Systems

Repeated Questions:

1. **With a neat sketch, describe the working of a simple carburetor.**
 - Appeared in: S25 (04), S22 (04)
2. **Explain the working of an MPFI (Multi-Point Fuel Injection) system. State its advantages.**
 - Appeared in: S25 (07), S23 (04 - brief), S22 (07)
3. **Define Stoichiometric, Rich, and Lean mixture.**
 - Appeared in: S25 (03), S22 (03)
4. **Explain mixture requirements for different loads and speeds in an SI engine.**
 - Appeared in: W23 (04), S23 (Factors affecting carburation - 04)
5. **List types of nozzles used in CI engines. Explain any one.**
 - Appeared in: W23 (03), W22 (03 - classification of CI chambers implies nozzles)
6. **Explain the construction and working of a Bosch fuel injection pump.**
 - Appeared in: W22 (07), W24 (Sketch - 04)

Other Important Questions:

- Explain ignition limit and stoichiometric mixture. (S23 - 03)
- What are the drawbacks of a simple carburetor? (W22 - 04)
- Explain the fuel supply system in a petrol engine. (S23 - 07) OR diesel engine. (S23 - 07)
- Derive the air-fuel ratio through approximate analysis of a simple carburetor. (S25 - 07 OR), S22 (07 OR), W22 (07)
- Explain the working of a Common Rail fuel injection system. (W22 - 07 OR)
- Explain the orifice-chamber method for air consumption measurement. (S24 - 04)
- What are the requirements of a good fuel injection system for a CI engine? (S22 - 04), S25 (04)
- Explain the compensating or double jet with a neat sketch. (S24 - 04)
- Explain the functions of parts of a simple carburetor: Venturi, Float chamber, Choke valve. (S24 - 03)
- Draw neat sketches of Solex carburetor and Carter Carburetor. (W24 - 04)
- How does a carburetor adjust the air-fuel mixture? (W24 - 03)

Unit 3: Combustion in SI and CI Engines

Repeated Questions:

1. **Explain the stages of combustion in an SI engine. (Often with a P- θ diagram)**
 - Appeared in: S25 (07), W24 (07), S23 (04 - brief), S22 (07), W22 (07 OR)
2. **Explain the stages of combustion in a CI engine. (Often with a P- θ diagram)**
 - Appeared in: S25 (07 OR), S24 (07), S23 (04 - brief), S22 (07 OR), W22 (07)
3. **Explain knocking/detonation in an SI engine. What are its causes, effects, and control?**
 - Appeared in: S25 (03, 04), S23 (03), S22 (04), W22 (07 - comparison)
4. **Explain knocking/detonation in a CI engine. What are its causes, effects, and control?**
 - Appeared in: S25 (03, 04 OR), W24 (03), S23 (Implied in C.I. combustion), S22 (04 OR), W22 (07 - comparison)
5. **Compare knocking in SI and CI engines.**
 - Appeared in: W22 (07), S24 (03)
6. **List different SI engine combustion chambers and explain any one with a sketch.**
 - Appeared in: W23 (04 OR), S23 (07), W22 (07 - types)

Other Important Questions:

- What is the importance of ignition lag in SI engine combustion? (W22 - 03)
- Define: Ignition lag, HUCR, Performance number. (S24 - 03)
- Explain the following terms: Run-on surface ignition, Run-away surface ignition, wild ping, Rumble, Pre-ignition. (W24 - 07)
- Explain the concept of detonation in CI engines. (W24 - 03)
- Explain factors affecting engine knocking. (W23 - 07 OR)
- Compare different combustion chamber designs for SI engines. (W24 - 07)
- Classify different types of combustion chambers in a CI engine. (W22 - 03 OR)
- Explain the Lanova air-cell combustion chamber. (S24 - 04)
- Explain basic requirements of a good combustion chamber. (W24 - 04)
- Explain induction swirl and compression swirl. (S23 - 03 OR)
- Evaluate why “Turbulence” is required in an SI engine and “Swirl” is required in a diesel engine. (S23 - 07 OR)

Unit 4: Engine Systems (Lubrication, Cooling, Supercharging)

Repeated Questions:

1. **Compare Air Cooling and Water Cooling systems.**
 - Appeared in: S25 (04 OR), S24 (04), S22 (04 OR)
2. **Compare Supercharging and Turbocharging.**
 - Appeared in: S23 (07), S24 (07), W22 (04 OR)
3. **Explain the Pressurized Water Cooling system with a neat sketch.**
 - Appeared in: S25 (07 OR), W23 (07), S22 (07 OR)
4. **Explain a Pressure Feed (Full Pressure) Lubrication system with a neat sketch.**
 - Appeared in: S25 (07), S22 (07)
5. **Explain the Splash Lubrication system with a neat sketch.**
 - Appeared in: W23 (07 OR), W22 (07 OR)
6. **What is supercharging? Explain its objectives and thermodynamic cycle.**
 - Appeared in: W24 (07), W23 (03), S22 (03)

Other Important Questions:

- Explain the necessity of engine cooling. (W23 - 03)
- Give the classification of the engine cooling system. (W22 - 03)
- List desirable properties of engine lubricants. (W24 - 03)
- Explain the S.A.E. rating of lubricants. (W24 - 03 OR), W22 (03)
- Explain types of lubricants and their properties. (W23 - 04)
- State the function of the lubrication system. (W22 - 03 OR)
- Enlist the functions of the lubrication system. (S24 - 03)
- Compare wet sump and dry sump lubrication systems. (S25 - 04 OR), W22 (04), S22 (04 OR)
- Explain the working principle of a stratified charge engine. (W23 - 03 OR), S24 (04)
- Explain turbocharger. (S22 - 03 OR)
- What is meant by pulse turbocharging? (W24 - 07 OR)
- Explain the engine air cooling system with a neat sketch. (W24 - 04 OR)

Unit 5: Engine Testing, Performance, and Emissions

Repeated Questions:

1. **Explain the Air Box method to calculate air consumption.**
 - Appeared in: S25 (03), W23 (04), S22 (03)
2. **Explain Willan's Line method to find friction power.**
 - Appeared in: S25 (04 OR), W23 (03), S22 (04 OR)
3. **Explain the Morse Test and perform calculations to find Indicated Power, Mechanical Efficiency, etc.**
 - *This is a very important numerical topic. Questions appear in almost every paper.*
 - Appeared in: S25 (07), S24 (07), W23 (07), W22 (07), S22 (07)
4. **Draw a Heat Balance Sheet (on kW and percentage basis) based on given observations.**
 - *Another crucial numerical topic.*
 - Appeared in: S25 (07 OR), S24 (07 OR), W22 (07)
5. **Explain emissions from SI and CI engines.**
 - Appeared in: S25 (04), W23 (04), S22 (03)
6. **Discuss the role of catalytic converters in controlling emissions.**
 - Appeared in: W23 (07), W22 (04 - comparison with thermal reactor)

Other Important Questions:

- What are the primary pollutants from an SI engine? (W23 - 07 OR)
- Explain diesel smoke and its control. (W23 - 03 OR)
- Explain EGR (Exhaust Gas Recirculation). (S23 - 04)
- Briefly explain Bharat Stage / EURO-III and EURO-IV norms. (S23 - 03), S24 (03)
- Explain effect on exhaust emission: A/F ratio, S/V ratio, Engine speed. (W23 - 04)
- Explain trouble shooting and overhauling of engines. (W23 - 04 OR)
- Explain CRDI (Common Rail Direct Injection) system. (S22 - 07 OR)
- Carry out mass analysis of carbon for complete/incomplete combustion. (S23 - 07 OR)
- Explain the working principle of a Wankel engine. (W24 - 03), W23 (07 OR), S24 (07)

Unit 6 & 7: Alternative Fuels and Unconventional Engines

Repeated Questions:

1. **Explain the working principle of a Wankel engine.**
 - Appeared in: W24 (03), W23 (07 OR), S24 (07)
2. **Explain the suitability of Biofuels (Methanol, Ethanol, etc.) as alternative fuels.**
 - Appeared in: W24 (04), S23 (Syllabus - 06)

Other Important Questions:

- Explain the working principle of a stratified charge engine. (W23 - 03 OR), S24 (04)
- Explain the advantages of using hydrogen as a fuel. (W22 - 04)
- Write a short note on alternative fuels. (W23 - 07 OR)
- Explain the following terms: Ice formation, Vapour lock, Back-firing. (S24 - 07)
