IC Engines & Fuels

IC Engine Basics (Q1–10)

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1. In a four-stroke petrol engine, the firing order for a four-cylinder engine is typically:

A) 1-2-3-4
B) 1-3-4-2
C) 1-2-4-3
D) 1-4-3-2

2. The compression ratio of a typical petrol (SI) engine is:

A) 14:1 to 22:1
B) 6:1 to 10:1
C) 2:1 to 4:1
D) 22:1 to 26:1

3. The compression ratio of a diesel (CI) engine is typically:

A) 6:1 to 10:1
B) 10:1 to 14:1
C) 14:1 to 22:1
D) 22:1 to 30:1

4. Which stroke in a four-stroke engine produces power?

A) Suction stroke
B) Compression stroke
C) Expansion (power) stroke
D) Exhaust stroke

5. The Otto cycle is the ideal cycle for:

A) Diesel engines
B) Gas turbines
C) Petrol engines
D) Steam engines

6. The Diesel cycle differs from the Otto cycle in that heat addition occurs at:

A) Constant volume
B) Constant temperature
C) Constant pressure
D) Constant entropy

7. Which of the following is NOT a 2-stroke engine operation event?

A) Scavenging
B) Firing
C) Valve overlap
D) Port opening

8. The mean effective pressure (MEP) is the:

A) Average pressure during combustion

B) Hypothetical constant pressure that produces same work as the actual cycle
C) Maximum pressure in the cylinder
D) Minimum pressure in the cylinder

9. Volumetric efficiency is defined as the ratio of:

A) Power output to fuel input
B) Actual charge inducted to the swept volume
C) Work done to heat supplied
D) Cylinder volume to clearance volume

10. Indicated thermal efficiency is the ratio of:

A) Indicated power to fuel power
B) Brake power to indicated power
C) Brake power to fuel power
D) Mechanical power to indicated power

Combustion (Q11–20)

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11. Knocking in SI engines is caused by:

A) Late ignition timing
B) Auto-ignition of the end gas before the flame front arrives
C) Rich air-fuel mixture
D) Low compression ratio

12. The octane number is a measure of a fuel's:

A) Calorific value
B) Viscosity
C) Knock resistance
D) Cetane value

13. Cetane number is relevant to:

A) Petrol engines
B) Gas turbines
C) Diesel engines
D) Two-stroke engines

14. A higher cetane number indicates:

A) Better knock resistance in SI engines
B) Shorter ignition delay in CI engines
C) Higher calorific value
D) Lower viscosity

15. The stoichiometric air-fuel ratio for petrol is approximately:

A) 9:1
B) 15:1
C) 20:1
D) 25:1

16. Diesel knock is caused by:

A) Too short an ignition delay
B) Too long an ignition delay leading to accumulated fuel combustion

C) Rich mixture
D) High octane fuel

17. Pre-ignition in SI engines refers to:

A) Ignition before the spark occurs
B) Ignition after top dead centre
C) Normal combustion
D) Late ignition

18. Swirl in diesel engines is used to:

A) Reduce compression ratio
B) Improve air-fuel mixing
C) Increase ignition delay
D) Lower combustion temperature

19. Which additive is used in petrol to improve octane number?

A) Tetraethyl lead (historically)
B) Cetane improver
C) Viscosity index improver
D) Wax inhibitor

20. The lambda (λ) value of 1 in an engine means:

A) Rich mixture
B) Lean mixture
C) Stoichiometric mixture
D) No fuel

Fuels (Q21–30)

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21. The calorific value of a fuel is:

A) Its viscosity index
B) The heat released per unit mass on complete combustion
C) Its density
D) Its octane number

22. Higher calorific value (HCV) includes:

A) Only latent heat of steam formed
B) Heat of combustion excluding latent heat of water vapour
C) Heat of combustion including latent heat of water vapour
D) None of the above

23. The approximate calorific value of diesel fuel is:

A) 29 MJ/kg
B) 44 MJ/kg
C) 55 MJ/kg
D) 120 MJ/kg

24. LPG mainly consists of:

A) Methane
B) Propane and butane
C) Hydrogen

D) Ethanol

25. CNG stands for:

A) Crude Natural Gas
B) Compressed Natural Gas
C) Catalytic Natural Gas
D) Clean Naphtha Gas

26. Which fuel has the highest calorific value?

A) Diesel
B) Petrol
C) Hydrogen
D) Coal

27. Biodiesel is produced by:

A) Fractional distillation of crude oil
B) Transesterification of vegetable oils or animal fats
C) Pyrolysis of coal
D) Steam reforming of methane

28. Which of the following is a renewable fuel?

A) Diesel
B) Petrol
C) Ethanol from sugarcane
D) LPG

29. Flash point of a fuel is:

A) Temperature at which fuel vapour ignites spontaneously
B) Lowest temperature at which vapour above fuel ignites briefly with external flame
C) Temperature of maximum combustion
D) Temperature of complete vaporization

30. Fire point is:

A) Temperature at which sustained combustion occurs
B) Temperature at which fuel vaporizes
C) The octane rating temperature
D) Same as flash point

Engine Performance (Q31–40)

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31. Brake thermal efficiency is the ratio of:

A) Brake power to indicated power
B) Brake power to heat supplied by fuel
C) Indicated power to heat supplied
D) Heat supplied to brake power

32. Mechanical efficiency of an engine is:

A) Brake power / Indicated power
B) Indicated power / Brake power
C) Brake power / Fuel power
D) Thermal efficiency × Volumetric efficiency

33. Specific fuel consumption (SFC) is expressed as:

A) kg/kWh
B) kW/kg
C) MJ/kg
D) L/km

34. The torque of an engine peaks at:

A) Maximum speed
B) Minimum speed
C) An intermediate speed
D) Idle speed

35. Brake power is measured by:

A) Indicator diagram
B) Dynamometer
C) Manometer
D) Pyrometer

36. Indicated power is calculated from:

A) Dynamometer readings
B) The P-V indicator diagram
C) Exhaust gas analysis
D) Fuel consumption measurement

37. Which type of dynamometer absorbs and measures power?

A) Transmission dynamometer
B) Absorption dynamometer
C) Inertia dynamometer
D) Eddy current dynamometer only

38. The Morse test is used to find:

A) Fuel calorific value
B) Indicated power of a multi-cylinder engine
C) Exhaust emissions
D) Cooling water temperature

39. A higher compression ratio generally results in:

A) Lower thermal efficiency
B) Higher thermal efficiency
C) Less power output
D) More fuel consumption

40. Detonation in CI engines can be reduced by:

A) Increasing ignition delay
B) Using low cetane fuel
C) Using high cetane fuel
D) Reducing injection pressure

Engine Components & Systems (Q41–50)

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41. The function of a carburetor in an SI engine is to:

A) Inject fuel at high pressure
B) Mix fuel and air in the correct ratio
C) Compress the charge
D) Filter the air

42. A turbocharger uses:

A) Electric motor to compress intake air
B) Exhaust gas energy to drive a compressor
C) Engine crankshaft to drive a supercharger
D) Fuel vapour to boost intake pressure

43. Intercooling in a turbocharged engine is used to:

A) Cool the engine oil
B) Cool the compressed intake air to increase its density
C) Cool the exhaust gases
D) Cool the turbocharger bearings

44. The function of a flywheel in an engine is to:

A) Increase compression ratio
B) Store energy and maintain uniform rotation
C) Filter the fuel
D) Control valve timing

45. Piston rings serve to:

A) Reduce friction only
B) Seal combustion gases and control oil consumption
C) Connect piston to crankshaft
D) Prevent piston from rotating

46. The function of a connecting rod is to:

A) Convert rotary to reciprocating motion
B) Convert reciprocating motion of piston to rotary motion of crankshaft
C) Store energy
D) Filter engine oil

47. Common rail direct injection (CRDI) in diesel engines provides:

A) Lower injection pressure
B) Multiple injections per cycle at high, constant pressure
C) Mechanical pump control only
D) Lower fuel efficiency

48. A catalytic converter reduces:

A) Engine noise
B) CO, HC, and NOx emissions
C) Fuel consumption
D) Engine vibration

49. EGR (Exhaust Gas Recirculation) in engines primarily reduces:

A) CO emissions
B) HC emissions
C) NOx emissions
D) CO2 emissions

50. The purpose of a diesel particulate filter (DPF) is to:

A) Filter air entering the engine
B) Remove soot particles from exhaust
C) Reduce NOx emissions
D) Filter fuel before injection

Thermodynamics of Engines (Q51–60)

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51. In the Otto cycle, the thermal efficiency depends on:

A) Compression ratio and specific heat ratio
B) Only on compression ratio
C) Only on cut-off ratio
D) Fuel type only

52. The Diesel cycle thermal efficiency is lower than the Otto cycle efficiency at the same compression ratio because:

A) Diesel uses lower octane fuel
B) Heat addition in Diesel occurs at constant pressure, not constant volume
C) Diesel engines have higher friction
D) Diesel fuel has lower calorific value

53. The Dual (Sabathe) cycle is a combination of:

A) Otto and Carnot cycles
B) Otto and Diesel cycles
C) Diesel and Rankine cycles
D) Stirling and Otto cycles

54. In a P-V diagram for a 4-stroke engine, the area enclosed represents:

A) Thermal efficiency
B) Net work done per cycle
C) Mechanical efficiency
D) Heat rejected

55. Increasing the inlet air temperature in a naturally aspirated engine:

A) Increases volumetric efficiency
B) Decreases volumetric efficiency
C) Has no effect on volumetric efficiency
D) Increases compression ratio

56. In an ideal Otto cycle, the process 1-2 (compression) is:

A) Isothermal
B) Isobaric
C) Isentropic (adiabatic reversible)
D) Isochoric

57. Brake mean effective pressure (BMEP) is:

A) Mean effective pressure based on indicated work
B) Mean effective pressure calculated from brake power output
C) Maximum cylinder pressure
D) Average intake manifold pressure

58. The indicated mean effective pressure (IMEP) is always:

A) Less than BMEP
B) Equal to BMEP
C) Greater than BMEP
D) Independent of BMEP

59. Scavenging efficiency in a 2-stroke engine is:

A) Ratio of fresh charge retained to cylinder volume
B) Ratio of exhaust removed to total cylinder contents
C) Efficiency of the scavenging pump
D) Ratio of power strokes to total strokes

60. Heat balance in an engine typically distributes heat input into:

A) Brake power only
B) Brake power, cooling water, exhaust, and radiation/unaccounted losses
C) Friction losses only
D) Cooling water and exhaust only

Fuel Injection & Ignition (Q61–70)

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61. The ignition system in a petrol engine produces a spark at:

A) BDC (bottom dead centre)
B) Slightly before TDC (top dead centre)
C) At BDC on the compression stroke
D) After TDC

62. Ignition advance is required because:

A) Combustion is instantaneous
B) Combustion takes finite time and must be complete near TDC
C) To reduce knock
D) To increase compression ratio

63. A distributor in a conventional ignition system:

A) Distributes fuel to cylinders
B) Distributes high voltage spark to each spark plug in sequence
C) Distributes cooling water
D) Controls air distribution

64. Electronic fuel injection (EFI) compared to carburetors offers:

A) Simpler construction
B) Better fuel-air mixture control and lower emissions
C) Lower cost
D) Less precise fuel delivery

65. Common rail pressure in modern diesel engines can reach:

A) 100-200 bar
B) 1000-2500 bar
C) 10-50 bar
D) 50-100 bar

66. Glow plugs in diesel engines are used for:

A) Igniting fuel during normal operation
B) Pre-heating the combustion chamber during cold starts
C) Reducing exhaust emissions
D) Increasing compression ratio

67. In GDI (Gasoline Direct Injection) engines, fuel is injected:

A) Into the intake port
B) Directly into the combustion chamber
C) Into the air filter
D) Into the exhaust manifold

68. Fuel atomization in diesel injection is important for:

A) Reducing injection pressure
B) Better mixing with air and complete combustion
C) Increasing ignition delay
D) Reducing compression ratio

69. Port fuel injection (PFI) injects fuel:

A) Directly into the cylinder
B) Into the intake port near the intake valve
C) Into the fuel tank
D) Into the exhaust

70. The purpose of a fuel pressure regulator is to:

A) Filter the fuel
B) Maintain constant fuel pressure at injectors
C) Measure fuel flow rate
D) Control ignition timing

Emissions & Environmental (Q71–80)

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71. The main pollutant causing photochemical smog is:

A) CO_2
B) SOx
C) NOx and unburned hydrocarbons (HC)
D) CO only

72. A three-way catalytic converter simultaneously reduces:

A) CO_2, SO_2, and NOx
B) CO, HC, and NOx
C) CO, SO_2, and particulates
D) HC, CO_2, and particulates

73. CO (carbon monoxide) emissions from engines are primarily caused by:

A) Complete combustion
B) Lean mixture combustion
C) Incomplete combustion due to rich mixture or poor mixing
D) High compression ratio

74. NOx emissions are highest when combustion temperature is:

A) Low

B) Moderate
C) Very high (near stoichiometric mixture)
D) Below 500°C

75. Particulate matter (PM) emissions in diesel engines originate from:

A) Complete combustion of fuel
B) Incomplete combustion producing soot
C) Combustion of lubricating oil only
D) Cooling water contamination

76. Euro 6 emission standards apply to:

A) Aircraft engines
B) Road vehicles
C) Marine diesel engines
D) Industrial generators only

77. SCR (Selective Catalytic Reduction) uses which reactant to reduce NOx?

A) Diesel fuel
B) AdBlue (urea solution)
C) Oxygen
D) Engine oil

78. Which engine type generally emits more NOx?

A) Spark ignition (petrol) engine
B) Diesel engine at high loads
C) Gas turbine
D) Stirling engine

79. HCCI (Homogeneous Charge Compression Ignition) engines offer:

A) High NOx and PM emissions
B) Low NOx and PM with high efficiency
C) Low efficiency but clean exhaust
D) Same emissions as conventional CI

80. The lambda sensor (oxygen sensor) in an exhaust system is used to:

A) Measure exhaust temperature
B) Monitor air-fuel ratio for closed-loop control
C) Filter exhaust gases
D) Reduce noise

Advanced Topics (Q81–90)

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81. Variable valve timing (VVT) in engines allows:

A) Changing compression ratio
B) Optimizing valve timing across engine speed range
C) Eliminating the camshaft
D) Increasing cylinder displacement

82. Engine downsizing refers to:

A) Making the engine physically smaller only
B) Using a smaller displacement turbocharged engine to replace a larger naturally aspirated one

C) Reducing the number of valves
D) Reducing engine speed

83. Homogeneous combustion in an SI engine means:

A) Fuel is injected directly
B) Air-fuel mixture is uniformly distributed throughout the cylinder
C) Only diesel fuel is used
D) Combustion occurs at constant pressure

84. Stratified charge combustion in GDI engines:

A) Produces a uniform mixture throughout the cylinder
B) Concentrates fuel near the spark plug for lean overall operation
C) Requires higher compression ratio
D) Eliminates the need for a catalyst

85. The knock sensor in a modern engine:

A) Detects knock and retards ignition timing
B) Advances ignition timing when knock occurs
C) Increases fuel injection duration
D) Opens the EGR valve

86. Cylinder deactivation technology in multi-cylinder engines:

A) Permanently disables cylinders
B) Deactivates some cylinders at light load to save fuel
C) Reduces cylinder bore size
D) Increases compression in remaining cylinders

87. Engine idling contributes to:

A) Reduced fuel consumption
B) Unnecessary fuel consumption and increased emissions
C) Better engine warm-up at all times
D) Improved volumetric efficiency

88. The Atkinson cycle engine operates with:

A) Compression ratio equal to expansion ratio
B) Expansion ratio greater than compression ratio for improved efficiency
C) Expansion ratio less than compression ratio
D) Constant pressure combustion

89. Miller cycle engines achieve efficiency gains by:

A) Increasing compression ratio beyond expansion ratio
B) Early intake valve closing to effectively reduce compression ratio while maintaining expansion
C) Eliminating cooling system
D) Constant volume heat addition only

90. Stop-start systems in vehicles reduce fuel consumption by:

A) Reducing engine displacement
B) Automatically shutting engine off at stops and restarting when needed
C) Using variable compression ratio
D) Increasing alternator output

Fuel Properties & Testing (Q91–100)

91. Reid Vapour Pressure (RVP) of petrol indicates:

A) Its cetane number
B) Its volatility/tendency to vaporize
C) Its density
D) Its viscosity

92. The pour point of a fuel or lubricant is:

A) Temperature at which it ignites
B) Lowest temperature at which it still flows
C) Temperature at which it boils
D) Temperature at which viscosity is measured

93. Cloud point of diesel fuel is:

A) Temperature at which diesel fuel turns cloudy due to wax crystal formation
B) Temperature at which diesel ignites
C) Pressure at which diesel vaporizes
D) Viscosity measurement temperature

94. The API gravity of crude oil relates to:

A) Its viscosity
B) Its density relative to water
C) Its octane number
D) Its sulfur content

95. Fractional distillation of crude oil produces, in order from lightest to heaviest:

A) Diesel → Petrol → Kerosene → LPG
B) LPG → Petrol → Kerosene → Diesel → Heavy oil
C) Petrol → Diesel → LPG → Kerosene
D) Kerosene → LPG → Diesel → Petrol

96. The sulfur content in modern ultra-low sulfur diesel (ULSD) is limited to:

A) 500 ppm
B) 50 ppm
C) 10 ppm
D) 1000 ppm

97. E10 petrol contains:

A) 10% methanol
B) 10% ethanol
C) 10% biodiesel
D) 10% hydrogen

98. The research octane number (RON) is measured at:

A) High speed and high temperature
B) Low speed (600 rpm) and low temperature
C) Medium speed
D) Variable conditions

99. Which combustion chamber shape in SI engines promotes fast, uniform flame propagation?

A) L-head (side valve)
B) Pent-roof with central spark plug

C) T-head
D) F-head

100. Regenerative braking in hybrid vehicles:

A) Uses brakes to generate heat
B) Converts kinetic energy into electrical energy during braking
C) Improves engine compression ratio
D) Reduces engine displacement