I.C Engines & Compressors

1. What do you mean by I.C. Engine? how are they classified?
2. Differentiate between SI and CI engines
3. What is C.I. Engine, Why it has more compression ratio compared to S.I. Engine.
4. Define Bore, stroke, compression Ratio, clearance ratio and mean effective pressure
5. Write short notes on Indicator diagram and indicated power
6. Explain the working of any air standard cycle (by drawing it on P-V diagram) known to you.
7. Why is it known as 'Air standard cycle.'? Draw the Diesel cycle on P-V coordinates and explain its functioning.
8. Stating the assumptions made, describe air standard otto cycle.
9. Describe the working of four stroke SI engine. Illustrate using line diagrams.
10. Describe the working of two stroke SI engine. Illustrate using line diagrams
11. What is meant by scavenging? What are different types of scavenging? Write any one in brief.
12. Compare Petrol engine with Diesel engine.?
13. Compare the working of 4 stroke and 2 – stroke cycles of internal combustion engines.
14. Calculate the thermal efficiency and compression ratio for an automobile working on ottocycle. If the energy generated per cycle is thrice that of rejected during the exhaust. Considerworking fluid as an ideal gas with $\gamma = 1.4$
15. A 4 stroke diesel engine has length of 20 cm and diameter of 16 cm. The engine is producingindicated power of 25 KW when it is running at 2500 RPM. Find the mean effective pressureof the engine.An engine of 250 mm bore and 375 mm stroke works on otto cycle. The clearance volume is 0.00263 m3.The initial pressure and temperature are 1 bar and 50ºC. If the maximum pressureis limited to 25 bar. Find(1) The air standard efficiency of the cycle.(2) The mean effective pressure for the cycle.
16. What are the various factors that affect the flame speed?
17. Define normal combustion?
18. Define abnormal combustion and its consequences?
19. What is equivalence ratio?
20. What are different methods of finding the frictional power of IC engine? Explain morsetest method and Williams line method.
21. The following observation were taken during a test on a single cylinder low speed 4- stroke cycle oil engine having a bore of 30 cm and stroke of 45 cm. Ambient air temp= 20 0C, duration of trial=1hr, total fuel consumption= 11.4 kg/hr, CV=42000 kj/kg, indicated mean effective pressure= 6bar, rpm = 30, net brake load = 1.5 kN, brake drum diameter = 1.8m, brake rope diameter = 2cm, quantity of jacket cooling water = 600kg/hr. temp of entering cooling water = 20 0C, temp of leaving cooling water = 75 0C, quantity of air = 250kg/hr. Sp. Heat of exhaust gases = 1kj/kg K. exhaust gas temp = 420 0C. Determine indicated power, brake power, mech efficiency, indicated thermal efficiency. Draw heat balance sheet
22. The power output of a six-cylinder four-stroke engine is absorbed by a water brake for which the law is WN / 20000 where the brake load, W is in Newton and the speed is in rpm. An air box with sharp edged orifice system measures the air consumption. The following readings are obtained: Orifice diameter = 30 mm; Bore = 100 mm; Stroke = 120 mm; C/H ratio by mass = 83/17; Coefficient of discharge = 0.6; Ambient pressure = 1 bar; Pressure drop across orifice = 14.5 cm of Hg; Time taken for 100 cc of fuel consumption = 20 sec.; Amb. Temperature = 270 C; Fuel density = 831 kg/m3.; Calculate: The brake power; The torque; The brake specific fuel consumption; The percentage of excess air and The volumetric efficiency

23. Explain the stages of combustion in S.I. engine with the help of P-θ diagram.
24. Define carburetion?with relevant figure explain its functioning. What are the factors effecting carburetion?
25. Derive an expression for Air- Fuel ratio for simple carburetor when air is treated as incompressible.
26. Drive exact solution for air in case of carburetor?
27. What are the different types air– fuel mixtures? What are the different range of throttle operation?
28. Explain why a rich mixture is required for the following 1. Idling 2. Maximum powerand sudden acceleration.
29. Describe briefly the MPFI system with a neat sketch? Explain port injection and throttle body injection system?
30. Briefly explain the stages of combustion in SI engines elaborating the flame front Propagation?
31. Explain the various factors that influence the phenomena of knock in SI engines?
32. Bring out clearly the process of combustion in CI engines and also explain the variousstages of combustion. What is delay period and what are the factors that affect thedelay period?
33. Explain with figures various types of combustion chambers used in CI engines?
34. Explain supercharging? Draw different types of supercharging?
35. What are the advantages of superchargers? What are objects of supercharging?
36. Give a comparative statement various characteristics that reduces knocking inS.I and C.I engine (any four)?
37. What are the major exhaust emissions?
38. What are the causes for hydrocarbon emission from S.I engine?
39. What are the reasons for flame quenching?
40. What is photochemical smog?Write a short note on carbon monoxide emissions?
41. What are soot particles?list factors responsible for emission of NOx?
42. Explain 3-ways catalytic converters with proper figure?
43. Explain the reasons for looking for alternate fules for IC engines.
44. Write the advantage and disadvantage of alcohol as a fuel?
45. List the advantages and disadvantagesof hydrogen as an IC engine?
46. Write the methods for hydrogen can be used in SI engines?
47. List the advantages and disadvantages of natural gas?
48. What are the advantages and disadvantages of LPG?
49. How the stratified charge engine can be characterised?
50. List the advantages and disadvantages of the stratified charge engine.
51. How the power and efficiency of the SI engine vary with air- fuel ratio fordifferent load and speed conditions?
52. Why is cooling system necessary in an automobile vehicle?What are the different methods of engine cooling?
53. What are the advantages and disadvantages of air cooled engines?What is the function of anti-freeze mixtures?
54. Why is the lubrication required for automobile maintenance?Describe briefly the different lubricating system?
55. Name the various properties of lubricants & briefly describe the following: - a] Viscosity, b] Flash point, c] Fire point, d] Cloud point.
56. Describe the effect of intercooler in a two-stage air compressor.
57. What do you mean by compressor? How are the compressors classified?
58. Obtain an expression for the minimum work required for a two-stage reciprocating air compressor?
59. Explain why an isothermal process is considered for compressing air?
60. Why multistage is done in reciprocating air compressor? Explain the importance of air-cooling in multi stage compressor. Also give advantages of multi stage over single stage compressor.
61. Derive the minimum work per kg of air delivered in two stage compressor with intercooler and without intercooler.

62. A 2-stage single acting reciprocating air compressor drawn 6kg/min 0of air at 1.013 bar and 293 K and the same is delivered at 14.75 bar. Assume perfect intercooling with compression index of 1.25. The clearance factor for low pressure and high pressure cylinder are 0.04 and 0.07. Determine 1. shaft power required with mechanical efficiency 85% 2.Isothermal efficiency 3. volumetric efficiency of each stage. 4. FAD.
63. A 2-stage reciprocating compressor takes air at the rate of 0.2 m3/sec. the intake pressure and temp. of air at 0.1MPa and 160 C. The air compressed to a final pressure of 0.7MPa. The inter-cooling is perfect. The compression index in both the stages is 1.25 and compressor runs at 600 rpm. Neglecting clearance determine 1. Intermediate pressure 2. Volume of each cylinder 3. Power required driving the compressor. Take mechanical efficiency 80% cp=1.005 Kj/kgK R=287 j/kg K.
64. Differentiate between reciprocating and rotary compressor?
65. What do you mean by axial flow compressors? Explain its working principle with neat sketch?
66. Write short note on surging and choking?
67. The centrifugal compressor is single inlet with an edge 55cm, hub 20 cm and an overall diameter of rotor as 100cm. it is supplied air at 200C and at 1bar. The rotor speed is 6000rpm. Compressor handles air mass of 30kg/sec and compresses to the pressure of 3bar. Find 1. Isentropic rotor efficiency based on impeller tip velocity with slip factor 0.9. 2. Power required.
68. An 8-stage axial flow compressor provides an overall pressure ratio of 6:1 with an isentropic efficiency 90%. When the temp of air at inlet is 20 0C. The work is equally divided between the stages. A 50% reaction design is used with a mean blade speed 188m/s and constant axial velocity 100m/s through the compressor. Estimate the power required and blade angles.