I.C ENGINES AND GAS TURBINES

1. Explain the working of two-stroke spark ignition engine with P-V diagram.
2. Explain with suitable sketches the working of four stroke spark-ignition engine.
3. Describe with suitable sketch the working principle of Wankel engine. What are its advantages and disadvantages.
4. Compare four stroke and two stroke cycle engines. Bring out clearly their merits and demerits.
5. Explain the parameters on the basis of which comparison of Otto, Diesel and Dual combustion cycles is done.
6. Briefly discuss the air-fuel mixture requirements of petrol engine from no load condition to full load.
7. Derive an expression for the calculation of air-fuel ratio for the carburetor.
8. State the essential requirements of a diesel injection system. Briefly discuss the types of solid injection system.
9. Explain the phenomenon of knock in CI-Engine and compare it with SI engine knock.
10. Define detonation. Discuss the effects of engine variables on detonation.
11. Name various theories of detonation. Explain the Pre-Ignition with neat sketch.
12. What is meant by delay period. Explain the variables affecting the delay period.
13. What is 'M' combustion chamber. What advantages are claimed for this design of combustion chamber.
14. Explain the essential properties of an ideal lubricant. List the types of lubricating systems and briefly discuss the wet sump lubrication.
15. Explain the following with neat sketches:
    i. Evaporative cooling system
    ii. Pressure cooling system
16. Explain the following performance parameters:
    i. I.H.P & B.H.P
    ii. Mean effective pressure and torque
    iii. Specific output
    iv. Volumetric efficiency
    v. Specific fuel consumption
17. Explain different categories of S.I. emissions. Briefly discuss any one of them. Also explain various factors affecting exhaust emission.
18. Explain various alternative fuels for I.C engines.

19. Describe the following methods of petrol exhaust emission:
    i. After burner
    ii. Exhaust manifold reactor
    iii. Catalytic converter system
20. Explain the compressor characteristics:
    i. Surging
    ii. Choking
    iii. Stalling
21. Define slip factor and derive an expression for work output using slip factor and work input factor.
22. With neat sketch, explain the inlet and exit velocity triangles for various types of blades.
23. Discuss briefly the methods employed for improvement of thermal efficiency of open cycle gas turbine.
24. In an open cycle constant pressure gas turbine, air enters the compressor at 1 bar and 300 K. The pressure of air after compression is 4 bar. The isentropic efficiencies of compression and turbine are 78% and 85% respectively. The air-fuel ratio is 80:1. Calculate the power developed and thermal efficiency of the cycle if the flow rate of air is 2.5 kg/sec.

    Take c_p = 1.005 kJ/kg k, Υ = 1.4 for air

    c_p = 1.147 kJ/kg k, Υ = 1.33 for gases

    R = 0.287 kJ/kg k

    Calorific value of fuel = 42,000 kJ/kg.
25. A six cylinder, four stroke spark-ignition of 10cm x 2cm with compression ratio of 6 is tested at 4800 r.p.m. on a dynamometer of arm 55cm. during a 10 min. test, the dynamometer reads 45 kg and the engine consumed 45 kg of petrol of calorific value 45 MJ/kg. the carburetor receives the air at 9 C and 1 bar at the rate of 10 kg/min. Calculate:
    i. The brake power
    ii. The brake mean effective pressure
    iii. The brake specific fuel consumption
    iv. The brake thermal efficiency
    v. The air-fuel ratio