B.TECH
(SEM V) THEORY EXAMINATION 2022-23
I.C.ENGINES & COMPRESSORS

Time: 3 Hours   *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 7 = 14**

   (a)   Define Heat Engine.
   (b)   Discuss the term "Volumetric Efficiency".
   (c)   Discuss the Ignition Delay in CI engine.
   (d)   Explain the term "Flame Speed" in SI engines.
   (e)   Explain working of Radiator.
   (f)   Explain Octane Number and Cetane Number for fuel.
   (g)   Define the terms Surging for centrifugal compressor.

SECTION B

2.   **Attempt any *three* of the following:**   **7 x 3 = 21**

   (a)   Differentiate SI and CI Engines in detail.
   (b)   Discuss the supercharging and its classification.
   (c)   Explain the working of battery ignition system with neat sketch also discuss the
          types of electronic ignition system.
   (d)   What is a three-way catalytic convertor? Give the catalysts used in it. How does
          the 3-way catalytic convertor differ in operation compared with 2-way
          convertor?
   (e)   Discuss an expression for volumetric efficiency of a reciprocating compressor
          while considering clearance volume.

SECTION C

3.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

   (a)   Discuss an expression for thermal efficiency of air standard Dual cycle.
   (b)   An engine works on air standard Diesel cycle whose compression ratio is 14.
          The pressure and temperature at the beginning of the cycle are 1 bar and 300 K
          respectively. The maximum temperature of the cycle is limited to 2500^0C.
          Determine the thermal efficiency and mean effective pressure of the cycle.

4.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

   (a)   Derive an expression for the calculation of exact A-F ratio when air is
          considered as incompressible.
   (b)   The diameter of the main jet of a simple carburetor is 0.24 cm and the pressure
          drop across the venturi is equivalent to 12 cm of water and the coefficient of
          discharge is 0.72. Density of petrol is 760 kg/m^3.Find the mass flow rate of fuel
          into the carburetor.

5. **Attempt any *one* part of the following:**   **7 x 1 = 7**

   (a)   Demonstrate combustion process and its phases in SI engine with neat sketch.

   (b)   Determine the velocity of injection of fuel in solid injection system when the difference in oil pressure and cylinder pressure is 80 bar. Assume the specific gravity of fuel as 0.92 and coefficient of discharge for orifice is 0.86.

6. **Attempt any *one* part of the following:**   **7 x 1 = 7**

   (a)   A four-stroke diesel engine consumes 24 kg/hr. When the engine develops an output of 100 kW. Calculate the brake and indicated specific fuel consumption if the mechanical efficiency of the engine is 80%. Also determine the brake and indicated thermal efficiencies if the calorific value of the fuel is 42000 kJ/kg.

   (b)   Explain Heat balance sheet with respect to an IC engine.

7. **Attempt any *one* part of the following:**   **7 x 1 = 7**

   (a)   A single stage, double acting air compressor delivers at 6 bar. It handles 15 m^3/min of air measured at free condition 1 bar and 15^0C respectively. The pressure and temperature at the end of suction are 0.96 bar and 30^0C respectively. The clearance ratio is 4% and the index of compression and expansion are n= 1.3. The speed of compressor is 600 rpm. Determine the stroke volume of the compressor. Also determine the IP of the compressor and temperature of air delivered. The effect of piston rod may be neglected. Assume stroke volume is 100 m^3 and clearance volume = 4m^3.

   (b)   Compare Centrifugal compressor and Axial Flow compressor in detail.