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**B TECH**  
**(SEM-V) THEORY EXAMINATION, 2018-19**  
**I.C. ENGINES & COMPRESSORS**

**Time: 3 Hours**

**Total Marks: 100**

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.  
2. Be precise in your answer. Draw neat diagrams wherever necessary.

**SECTION A**

1. Attempt *all* questions in brief.

2 x 10 = 20

- (a) What do you understand by CC of engine?
- (b) Define Mechanical Efficiency, ISFC, BSFC, IP.
- (c) What do you mean by scavenging process in two stroke engines?
- (d) Why the power output of an engine reduces at high altitude compare to its rated output at sea level?
- (e) Give the difference between L-MPFI & D-MPFI System.
- (f) What do you understand by terms “Dopes & Additives”?
- (g) What is surging and choking in compressor?
- (h) Definition of Octane Number and Cetane Number?
- (i) What is SAE? Mention the importance of SAE to the automobile domain.
- (j) How does the thermostat work?

**SECTION B**

2. Attempt any *three* of the following:

10 x 3 = 30

- (a) An engine works on Dual cycle having compression ratio of 10. The pressure and temperature at the beginning of compression stroke are 1 bar and 27<sup>0</sup> C respectively. If the maximum pressure reached is 42 bar and the maximum temperature of the cycle is 1500<sup>0</sup> C, calculate:
  - (a) The temperature at the end of constant volume heat addition
  - (b) Cut-off ratio
  - (c) Work output
  - (d) Efficiency of the cycleTake  $C_v = 0.717 \text{ kJ/ kg K}$  and  $C_p = 1.004 \text{ kJ/ kg K}$  for air.
- (b) A simple carburetor has to supply 5 kg of air per minute, at a pressure of 1.013 bar and temperature of 27<sup>0</sup> C. Calculate the throat diameter of the choke for air flow velocity of 90 m/s. Take discharge coefficient to be 0.8. Assume isentropic flow and flow to be compressible.
- (c) Explain the term knocking in C. I. engine. How it is different from knocking in S. I. engine?
- (d) Write the short notes on following-
  - (i) Mist lubrication system
  - (ii) Crankcase ventilation
- (e) What is meant by the ‘axial flow compressor’? Why is it name so? Sketch and explain the construction and working of an axial flow compressor.

## SECTION C

3. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) What is the basic difference between Otto cycle & Diesel cycle? Deduce the expression of thermal efficiency for Diesel cycle.
- (b) An air standard Stirling cycle is equipped with a 100% efficient regenerator system. The isothermal compression commences from 1 bar and 310 K, and subsequent heat addition at constant volume raises the pressure and temperature to 16 bar and 930 K. The cycle is finally completed through an isothermal expansion and constant volume heat rejection. Analyze each of the four processes for work and heat transfer and determine the engine efficiency.
4. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) What are the advantages of electronic ignition system over conventional system? Give the brief explanation of TCI & CDI system with its circuit diagram.
- (b) A simple jet carburetor is required to supply 5 kg of air and 0.5 kg of fuel per minute. The fuel specific gravity is 0.75. The air is initially at one bar and 300 K. Calculate the throat diameter of the choke for a flow velocity of 100 m/s. Velocity coefficient is 0.8. If the pressure drop across the fuel metering orifice is 0.80 of that of the choke, calculate orifice diameter assuming,  $C_{df} = 0.60$  and  $\gamma = 1.4$
5. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) What are the major sources of air pollutants? Classify the pollution control devices used in C. I. engine? With the help of neat sketch, describe working of each.
- (b) Draw sketches showing the constructional features of different type of nozzle used in automobile diesel engine and explain the function of each.
6. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) Enumerate the lubrication system and explain wet sump lubrication system with the help of neat sketch.
- (b) A 4-cylinder 2-stroke cycle petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 18 bar and mechanical efficiency is 18%. Calculate the
- (i) diameter and stroke of each cylinder having stroke to bore ratio of 1.5.
- (ii) fuel consumption of the engine, if brake thermal efficiency is 28%. The calorific value of the fuel is 43900 kJ/kg.
7. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) What is difference between reciprocating and centrifugal compressor? Explain the effect of intercooling on the performance of reciprocating compressor. Obtain expression for optimum pressure ratio with one stage, intercooling.
- (b) A single acting two stage air compressor with complete intercooling delivers 10 kg/min of air at 16 bar pressure. The suction occurs at 1 bar, 15<sup>0</sup>C. the compression and expansion processes are reversible polytropic with polytropic index  $n = 1.25$ . Calculate:
- (i) The power required
- (ii) The free air delivery
- (iii) The isothermal efficiency