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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4094 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

I.C. ENGINES

Time : 3 Hours *Total Marks : 100*

Note : (i) Attempt **all** questions.
(ii) Assume suitably, any missing data.
(iii) Be precise in your answer.

1. Attempt any **two** of the following : **(10×2=20)**
   (a) How the thermal efficiency vary with equivalance ratio for air standard, fuel-air and actual cycle ? A diesel engine having compression ratio 14, operates on A/F ratio of 50:1. The temperature and pressure of air at the beginning of compression is 60°C and 1 bar. Find the efficiency and mean effective pressure of engine, assume engine works on air standard cycle, C.V. of fuel is 42 MJ/kg, $C_{p,air}$=1.004kJ/kg.
   (b) Answer the following :
      (i) Compare the Otto and Diesel cycle for same maximum pressure and heat input with the help of p-V and T-s diagram.
      (ii) How SI engine fuels are rated ?
   (c) Answer the following :
      (i) Discuss the suitability of vegetable oil as fuel in diesel engine.
      (ii) Draw the valve timing diagram for four stroke SI engine for high speed and low speed applications.

2. Attempt any **two** of the following : **(10×2=20)**

(a) A simple jet carburetor is required to supply 6 kg of air per minute and 0.45 kg of fuel of density 740 kg/m^3. The air is initially at 1.013 bar and 27°C. Calculate the throat diameter of the choke for a flow velocity of 92 m/s. Velocity coefficient is 0.8. If the pressure drop across the fuel metering orifice is 0.75 of that at the choke, calculate orifice diameter assuming coefficient of discharge is 0.60

(b) Discuss the following :

(i) Effect of engine speed and load on flame propogation in SI engine.

(ii) Effect of spark timing, engine load & compression ratio on detonation in SI Engine.

(c) Describe the battery ignition system with neat sketch. What are its demerits and how these can be overcome ?

3. Attempt any **two** of the following : **(10×2=20)**

(a) Explain the stages of combustion in CI engine with the help of P-θ diagram. It is desired for combustion to start at 15 btdc in a CI engine running at 1600 rpm. If the ignition delay of fuel in milliseconds is 0.6 ms, find the crank angle at which fuel injection should start.

(b) What are the major pollutants in SI engine and CI engine ? Name different exhaust treatment devices to reduce pollutants and discuss the working of any one of them.

(c) How injection timing affects the diesel knock ? State the requirement of ideal injection system. Discuss the common rail injection system.

4. Attempt any **two** of the following : **(10×2=20)**

(a) Answer the following :

(i) What do you understand by supercharging ? What is its effect on engine performance and what are the limitations of supercharging in IC engine ?

(ii) The air flow to a four cylinder (D=10.5 cm; L=12.5cm) four stroke oil engine running at 1200 rpm is measured by means of a 5 cm diameter orifice, having a coefficient of discharge of 0.6. Pressure drop across orifice = 5.7 cm of water; ambient temperature and pressure were 20°C and 1.013 bar respectively. Find the volumetric efficiency of the engine.

(b) Answer the following :

(i) Why cooling of engine is necessary ? Discuss the working of pressurized cooling system.

(ii) Discuss the function of lubricant in an engine. How lubricating oils are classified ?

(c) What do you understand by blow by ? How it effects the engine emission and how it can be reduced ?

5. Attempt any **two** of the following : **(10×2=20)**

(a) Make comparison between reciprocating and centrifugal compressor. Explain the effect of intercooling on the performance of multistage reciprocating compressor. Obtain expression for optimum pressure ratio with one stage intercooling.

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(b) With the neat sketch, explain the working of centrifugal compressor, clearly discussing how the pressure changes take place in impeller and diffuser.

(c) Discuss the effect of intake temperature, clearance and compression index on the performance of reciprocating compressor. Air at 1 bar and 15°C is compressed to 10 bar in a single acting compressor. The compression index is 1.2. Find the work input per kg of mass compressed and heat transfer to the surrounding during compression process.