



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

PAPER ID : 4094

Roll No.

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## B. Tech.

(SEM. VI) EXAMINATION, 2007-08

### I C ENGINES

Time : 3 Hours]

[Total Marks : 100

- Note :
- (1) Attempt all questions.
  - (2) All questions carry equal marks.
  - (3) If any data, missing assume suitably.

1 Answer any **four** of the following : 5×4=20

- (a) How does the composition of exhaust gases in a petrol engine vary for various Air Fuel (A/F) ratio?
- (b) Draw the valve timing diagram for two stroke engine.
- (c) What do you understand by stratified charge engines?
- (d) Write down the merits and demerits of using CNG as a fuel in IC Engine.
- (e) With the help of suitable diagram shows that for same maximum pressure and work output, efficiency of diesel engine is more than petrol engine.
- (f) Find the stoichiometric air-fuel ratio (A/F) for the engine operating on mixture of 25% methanol and 75% gasoline ( $C_8H_{15}$ ) by mass.



2 Answer any **two** of the following : 10×2=20

- (a) Make comparison between magneto and Battery ignition system. How the exhaust emissions are affected by ignition timing?
- (b) Describe the phenomenon of detonation in SI engines. On what factors does detonation depend?
- (c) (i) With a neat sketch explain the working of simple carburetor.  
(ii) A spark plug is fired at  $18^\circ$  BTDC in an engine running at 1800 RPM. It takes  $8^\circ$  of engine rotation to start combustion and get into flame propagation mode. Flame termination occurs at  $12^\circ$  ATDC. Spark plug is offset 8 mm from the centre line of combustion chamber. Find the Bore of the cylinder if the flame front speed is 24.5 m/sec.

3 Answer any **two** of the following : 10×2=20

- (a) (i) With a schematic diagram, show the main components of a diesel injection system?  
(ii) Draw a sketch of Pintaux nozzle and discuss its merits.
- (b) What action can be taken in order to reduce the possibility of knocking in CI engine; for the following variables ?
  - (i) Fuel
  - (ii) Compression ratio
  - (iii) Engine load and speed
  - (iv) Supercharging
  - (v) Jacket water temperature.Justify your answer with reason.

- (c) Why there is trade off between NO<sub>x</sub> and Particulate matter emission? How will you control the particulate matter emission from the engine exhaust?

4 Answer any **two** of the following : 10×2=20

- (a) A six cylinder, 4.8 litre, supercharged engine operating at 3500 rpm has an overall volumetric efficiency of 158%. The supercharge has an isentropic efficiency of 92% and a mechanical efficiency in its link with the engine of 87%. It is desired that the air be delivered to the cylinder at 65°C and 180 kPa, while ambient conditions are 23°C and 98 kPa.

*Calculate:*

- (i) Amount after cooling needed  
(i) Engine power lost to run supercharges.
- (b) (i) Discuss, why engine cooling is necessary.  
(ii) Discuss wet sump lubrication system with a neat sketch.
- (c) The air flow to a four stroke, four cylinder engine is measured by a 5 cm diameter orifice, having coefficient of discharge of 0.6. During test following data were recorded :
- Bore=10.5 cm, stroke=12.5 cm, engine speed=1200 rpm, brake torque=147 N-m, fuel consumption=5.5 kg/hr, head across orifice=5.7 cm of water, calorific value of fuel=43.1 MJ/kg, Ambient temperature and pressure=20°C and 1.013 bar; calculate:
- (i) brake specific fuel consumption  
(ii) volumetric efficiency  
(iii) brake thermal efficiency.



5 Answer any **two** of the following : 10×2=20

- (a) Show that heat rejected per stage per kg of air in a reciprocating compressor with perfect intercooling is given by

$$\left[ C_p + C_v \left( \frac{\gamma - h}{\gamma - 1} \right) \right] (T_2 - T_1)$$

Where,  $(T_2 - T_1)$  = temperature rise during compression

$h$  = polytropic index of compression

$\gamma$  = adiabatic index,  $C_p$ ,  $C_v$  = specific heats of air.

- (b) (i) Make comparison between reciprocating and rotary air compressors.
- (ii) A roots blower compresses  $0.08 \text{ m}^3$  of air from 1.0 bar to 1.5 bar per revolution. Calculate the compressor efficiency.
- (c) Write short notes on any two of the following :
- (i) interstage cooling of reciprocating compressors.
- (ii) Slip factor
- (iii) Performance characteristics of rotary compressor.
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