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Printed Pages : 4 TME – 602

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

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

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 carburator.

(ii) A spark plug is fired at 18° BTDC in an engine running at 1800 RPM. It takes 8° of engine rotation to start combustion and get into flame propogation mode. Flame termination occurs at 12° 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 it 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 NOx 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.

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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, $(T_2\text{-}T_1)$ = temperature rise during compression

h = polytropic index of compression

γ = adiabatic index, $\mathbf{C_p}$, $\mathbf{C_v}$ = specific heats of air.

(b) (i) Make comparison between reciprocating and rotary air compressors.

(ii) A roots blower compresses 0.08 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.