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B.TECH
PCME4302

5th Semester Regular / Back Examination 2015-16

I.C.ENGINES AND GAS TURBINES

BRANCH: MECH

Time: 3 Hours

Max marks: 70

Q.CODE: T376

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**

a) "Four stroke engine has a higher part load efficiency than two stroke engine".True or False,Justify.

b) What do you mean by pumping loss in I.C.Engines?

c) Show the variation of pressure with A/F ratio at different compression ratios for an SI engine.

d) Define flash point and fire point of fuel for CI engines.

e) What is the effect of turbocharging on SI engine?

f) Write down how reheating affects the efficiency and work output of gas turbine plant.

g) Write down the firing orders for a four cylinder and six cylinder I.C.engine.

h) Write two methods to measure the frictional power loss of an engine.

i) What is slip? How it affects the compressor?

j) Arrange the following hydro carbons in the increasing order of their knock resistance for SI engines:
Aromatic,napthene,paraffin.

Q2 **a)** Draw the valve timing diagram for 4 stroke CI and 2-stroke SI engine. **(4)**

b) A four stroke ,four cylinder diesel engine running at 2500rpm develops 70KW.Brake thermal efficiency is 35% and calorific value of fuel is 41MJ/kg. Engine has a bore of 110mm and stroke of 100mm.Take ρ for air as 1.12kg/m^3,A/F ratio 16:1 and mechanical efficiency =0.75.Calculate(i)Fuel consumption(kg/Hr) (ii)Air consumption (iii)Indicated thermal efficiency (iv)Voumetric efficiency (v)Brake mean effective pressure (vi)mean piston speed. **(6)**

Q3 **a)** Explain briefly about the important characteristics of CI engine fuels. **(4)**

b) A simple jet carburetor is required to supply 5 kg of air and 0.6 kg of fuel per minute. The specific gravity of fuel is 0.7.The air is initially at 1bar and 25^{o}C.Calculate the throat diameter of choke for a flow velocity of 90m/s. Velocity coefficient is 0.85.If the pressure drop across the fuel metering orifice is 75 % of that of the choke, calculate orifice diameter assuming coefficient of discharge for fuel to be 0.7 and γ=1.4. **(6)**

Q4 **a)** Explain various stages of combustion in SI engine. **(4)**

b) Describe how ignition delay affects knocking in CI engines. Discuss the parameters which affect the ignition delay in CI engines. **(6)**

Q5 **a)** What do you mean by supercharging? Discuss the various arrangements of supercharging for an engine. **(6)**

b) Differentiate between the battery and magneto ignition system . **(4)**

Q6 **a)** Briefly explain the methods to measure brake power of an engine. **(5)**

b) Discuss the different types of cooling systems used for IC engines. **(5)**

Q7 An ideal open cycle gas turbine plant using air operates in an overall pressure ratio of 4 and between temperature limits of $27^{O}C$ and $727^{O}C$. It is attached with a heat exchanger to extract the heat from turbine exhaust gases and an intercooler between two sage compressors. Assuming C_p=1.005 kj/kg.K and C_v=0.718 kj/kg.K, perfect intercooling ,optimum stage pressure ratios and perfect regeneration find the specific work output and thermal efficiency for the plant. Compare it with a simple gas turbine plant without the heat exchanger and intercooler. **(10)**

Q8 Write short notes on any two: **(5 x 2)**

a) Willan's Line Method

b) MPFI system

c) Torboprop engine

d) Catalytic Converters