Total No. of Questions : 8] *[Total No. of Printed Pages : 6*

Roll No .....

ME-601-CBGS

B.Tech., VI Semester

Examination, December 2020

Choice Based Grading System (CBGS)

Thermal Engineering and Gas Dynamics

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) Assuming missing data suitably.

iii)In case of any doubt or dispute the English version question should be treated as final.

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1. a) Define boiler and how are boilers are classified? 4

   b) Explain the process of fuel handling and ash handling systems with a neat diagram. 5

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c) What are the factors considered in drawing heat balance sheet in boilers? 5

2. a) Explain the working principle of Rankine cycle. 7

b) In a Rankine cycle, the steam at inlet to Turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Determine 7

i) The pump work

ii) Turbine work

iii) Rankine efficiency

iv) Condenser heat flow

v) The dryness at the end of expansion. Assume flow rate of 9.5kg/sec.

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3. a) What is fluid Mach number? Derive the expression for fluid Mach number. 5

b) Why the Mach number parameter so important for the study of flow of compressible fluids? 4

c) Find the velocity of bullet fired in standard air, if its mach angle is 30°. 5

30°

4. a) What is sonic velocity? On what factors does it depend? 7

b) An aeroplane is flying at 21.5m/s at a low altitude where the velocity of the sound is 325m/s. At a certain point just outside the boundary layer of the wings, the velocity of air relative to the plane is 305m/s. If the flow is frictionless adiabatic determine the pressure drop on the wing surface near this position assume r =1.4 ambient pressure of air=102 kN/m^2. 7

21.5m/s

325m/s

r

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5. a) Classify Compressors and Describe the working of single stage reciprocating Compressor. 7

b) A Single stage single acting reciprocating air compressor compresses air by a ratio of 7. The clearance volume is 6.2% of cylinder volume for volumetric efficiency of 0.5 and stroke to bore ratio of 1.3 determine the dimensions of cylinder. 7

7

0.5

6.2% 1.3

6. a) What do you understand by multi stage compression? What are it's merits over single stage compression? 7

b) A single stage reciprocating air compressor takes in 8m^2/min of air at 1 bar and 30°C and delivers at 6 bar. The clearance is 5% of the stroke. The expansion and compression are polytrophic with the value of n =1.3. Calculate 7

i) The temperature of delivered air

ii) Volumetric efficiency

iii) Power of the compressor

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7. a) What do you understand by condenser? Discuss it significance. 5

   b) Differentiate between surface condenser and jet condenser. 4

   c) Discuss the relevance of Dalton's law of partial pressures in condenser calculations. 5

8. a) What do you understand by cooling towers? Explain their utility. 5

   b) Briefly explain the Back pressure and its effect on plant performance air leakage and its effect on performance of condensers. 5

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c) Determine vacuum efficiency of a surface condenser having vacuum if 715mm of Hg ad temperature of 32°C. The Barometer Reading is 765mm of Hg. 4

Hg

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