SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | | Total number of pages:[2]

Total number of questions: 06

May 2018

2014 Batch onwards

B.Tech. || AT-I || 3rd Sem

Applied Thermodynamics-I

Subject Code: BTME-304A/304

Reappear

Paper ID:

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**
- **Use of steam tables and Mollier diagram in allowed.**

PART A (2×10)

Q. 1. Short-Answer Questions: All COs

(a) What do you understand by the term draught? How it is useful for estimating height of the chimney.

(b) What are the unique features of high pressure boilers?

(c) What is reheating of steam? Why there is necessicity of reheating the steam?

(d) What is meant term air standard efficiency? What is its importance?

(e) What is Rankine cycle? State the methods to improve its thermal efficiency?

(f) What is phenomenon of detonation in S.I. engine? How it can be controlled?

(g) How the normal combustion is different from non- stiochometric combustion?

(h) How will you distinguish the phenomenons of squish and swirl in an IC engine?

(i) What do you mean by supersaturated flow?

(j) What are the reasons which reduce the efficiency of a condenser?

PART B (8×5)

Q. 2. What do you mean by valve timing diagram? Draw the actual valve timing of a four stroke S.I. engine and differentiate it from theoretical valve timing diagram with the help of neat sketch. COa

OR

The following particulars were obtained in a trial on a 4 -Strole IC engine. COa

Duration of trial	1 hour	Fuel consumption	20000 litres
Revolution	14000	LCV of fuel at supply condition	21 kJ/litre
Stroke length	400 mm	Cylinder diameter	250 mm
Net brake load	1470 N	Number of missed cycles	500
Mean effective pressure	7.5 bar	Effective brake circumference	4 m
Compression ratio	6.5:1		

Determine the Indicated power, brake power mechanical efficiency and Indicated thermal efficiency of the engine.

COb

Q. 3. How will you differentiate water tube boiler from a fire tube boiler? Describe the working of one each type of boiler with the help of a neat sketches.

OR

What are limitations of rankine cycle which lead to formation of regenerative cycle? Discuss the working of regenerative cycle with the help of neat sketch? COb

Q. 4. How will you differentiae the impulse turbine from reaction turbine. Explain a single stage impulse turbine with the help of a neat sketch What are pressure and velocity variations in single stage impulse turbine. COc

OR

What do you mean by term compounding in steam turbines? Elaborate the various differences between pressure and velocity compounding by suitable diagrams also? COc

Q. 5. Steam at a pressure of 15 bar and dryness fraction 0.97 is discharged through a convergent divergent nozzle to a back pressure of 0.2 bar. The mass flow rate is 9 kg/h. If the power developed is 220 kW. Determine : COd

(a) Throat pressure
(b) Number of nozzles required if each nozzle has a throat of rectangular crossection of 4mm x 8mm.
(c) If 12 % of overall isentropic enthalpy drop reheats the steam by friction in the divergent portion, also find crossection of the exit rectangle.

OR

How will you classify the condensers? In what respect a jet condenser differs from a surface condenser. Elaborate their working with neat sketches. How will you determine the efficiency of a steam condenser? COd

Q. 6. During a boiler trial, the dry flue gas analysis by volume was reported as : COe

CO_2=13 % ; CO = 0.3%; O_2 = 6% :N_2=80.7%

The coal analysis by mass was reported as :

C= 62.4%; H_2= 4.2%: O_2= 4.5 %: O_2 = 4.5 % ; moisture =15% : ash = 13.9%

Calculate:

(a) minimum air required to burn 1 kg of coal
(b) mass of air actually supplied per kg of fuel
(c) amount of excess of air required supplied per kg of coal burnt.

OR

An Impulse turbine has a mean blade speed of 200 m/s. The nozzles are inclined at an angle of 20° to the plane of rotation of blades. The steam velocity from nozzles is 600 m/s. The turbine uses 3500 kg/h of steam. The absolute velocity at the exit is along the axis of turbine. Assuming the inlet and exit blade angles to be equal, Determine: COe

(a) Inlet and exit angles of blade
(b) Power output of the turbine
(c) Diagram efficiency
(d) Axial thrust