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Total No. of Pages: 02
Total No. of Questions: 09

B. Tech. (ME) (Sem.-3rd)
APPLIED THERMODYNAMICS-I
Subject Code: BTME-304
Paper ID: A1141

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

INSTRUCTION TO CANDIDATES:-
1. Section A is compulsory consisting of 10 questions each carrying 2 marks.
2. Section B contains five questions each carrying 5 marks. Attempt any 4 questions.
3. Section C contains 3 questions each carrying 10 marks. Attempt any 2 questions.

Section-A   (2x10)

Ql.   Write briefly:
- a)   What is stoichiometric air fuel ratio?
- b)   Define the term "Enthalpy of formation".
- c)   Draw an Valve timing diagram for a four stroke CI engine.
- d)   List two advantages of supercharging.
- e)   What is a pure substance?
- f)   Why do isobars in a Mollier diagram diverge from one another?
- g)   Differentiate between boiler mountings and accessories.
- h)   Why is a Carnot cycle not practicable for a steam power plant?
- i)   What is the function of a steam nozzle?
- j)   Define the term "degree of reaction" for a turbine.

Section-B   (4x5)

Q2.   Describe the phenomenon of detonation in S.I. engines. How can it be controlled?

Q3.   Steam at 18 bar and dryness fraction 0.9 is heated at constant pressure until dry and saturated. Find the increase in volume, heat supplied and work done per kg of steam.

Q4.   The following readings were taken during a test on a surface condenser: Vacuum in condenser=710 mm of Hg

Barometer reading =765 mm of Hg

Temperature in condenser=35°C

Condensate temperature=28°C

Cooling water circulated per hour =60 tonnes

Inlet temperature of cooling water= 10° C
Outlet temperature of cooling water =25° C

Condensate collected per hour = 2 tonnes

Calculate   (i) the vacuum efficiency of the condenser

                (ii) Condenser efficiency.

                (iii) Quality of steam entering the condenser.

Q5.   Explain with sketch the constructional details and working of a Cochran boiler.

Q6.   What is the effect of regeneration on

(i)specific output

(ii)cycle efficiency

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(iii)steam rate of a steam power plant.

Section-C   (2 x 1 0)

Q7.   A 50% reaction turbine with symmetrical velocity triangles running at 400 r.p.m has the exit angle of the blades as 20° and the velocity of steam relative to blades at the exit is 1.35 times the mean blade speed .The steam flow rate is 8.33kg/s and at a particular stage the specific volume is $1.381 m^3$/kg. Calculate for this stage:

(i)   A suitable blade height assuming the rotor mean diameter 12 times the blade height and

(ii)   (ii)The diagram work.

Q8.   Determine the throat area ,exit area and exit velocity for a steam nozzle to pass a   mass   flow of 0.2 kg/s when inlet conditions are 10 bar and 250°C and the final pressure is 2 bar. Assume the expansion to be isentropic and inlet velocity to be negligible. Use the index of expansion as 1.3.

Q9.   Write short notes on:

(i)   Cooling towers and their operation.

(ii)   Governing of steam turbines.

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