Total No. of Printed Pages:2

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B   1) Question No.1 and 6 are compulsory from each section A & B.

2) Solve any two questions from remaining questions in each section A & B.

3) Use of steam table, mollier diagram is permitted.

4) Assume suitable data if required.

Section A

Q.1   Solve any five   10

i)   Write four boiler accessories

ii)   Differentiate between water tube boiler and fire tube boiler.

iii)   State function of fusible plug.

iv)   Classify draught.

v)   Write applications of steam.

vi)   Write functions of chimney

vii)   Define nozzle efficiency.

Q.2   a) Explain 'La-Mont' boiler.   07

b) In a boiler test 1250 Kg of coal are consumed in 24 hours. The mass of water   08
evaporated is 13000 kg and the mean effective pressure is 9 bars. The feed water
temperature was 35°C, heating value of coal is 30 MJ/Kg;
Determine   i) Equivalent Evaporation   ii) Efficiency of boiler.

Q.3   a) Derive the equation for height of chimney   07

b) In a chimney of height 50 meters temperature of all gases with natural draught is   08
350°C. The temperature of waste gases using artificial draught is 127°C. If air
supplied is 19 kg/kg of fuel burnt, determine the efficiency of chimney. Assume,
Cp=1.005 KJ/Kg-K for fine gases.

Q.4   a) Explain effect of back pressure on nozzle characteristics.   07

b) Dry saturated steam at 10 bars is expanded isentropically in a nozzle to 0.2 bar using   08
steam tables only; find the dryness fraction of steam at exit. Also find the velocity of
stem leaving the nozzle When 1. Initial velocity is negligible and 2. Initial velocity of
stem is 130 m/sec.

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Q.5   Write short note on (Any three)   15
        a) Boiler efficiency
        b) Isentropic flow through nozzle.
        c) Mechanical draught.
        d) Classification of boilers.

Section – B

Q.6   Solve any five   10
        i)   What is cooling tower?
        ii)   Define vacuum efficiency
        iii)   Limitations of Carnot cycle.
        iv)   Define swept, clearance and total volume of compressor.
        v)   Write any two applications of compressed air
        vi)   Define compression ratio.
        vii)   What is single acting and double acting compressor?
        viii) Write any two advantages of multistage compression.

Q.7   a) Derive the expression for the mass of circulating water required in condenser.   08
        b) The vacuum at the extraction pipe in a condenser is 710 mm of Hg and the temp. is   07
            36°C. The barometer reads 758 mm of Hg. The air leakage into the condenser is 4
            kg per 10,000 kg of steam. Determine (1) the volume of air to be dealt with by the
            dry air pump per kg of steam entering condenser and (2) the mass of water vapor
            associated with this air.
            Take R=287 J/kg-K for air.

Q.8   (a) Explain modified Ranking cycle.   05
        (b) A steam engine admits steam at a pressure of 6.6 bar and 0.9 dry. The cut-off occurs at 10
            one-half stroke and pressure at release is 2.6 bars. The back pressure is 1bar. Find the
            modified Rankine efficiency of the engine, assuming the pressure drop at release to
            take place at constant volume. Neglect clearance volume.

Q.9   (a) Explain with neat diagram centrifugal compressor.   06
        (b) Estimate the work done by a two stage reciprocating single acting air compressor to   09
            compress $3m^3$ of air per minute at 1.05 bars and 12°C to a final pressure of 38 bars. The
            intermediate receiver cools the air at 30°C and 5.6 bar pressure. For air, take n=1.4.

Q.10 Write short note on (Any three)   15

        a) Air Motor
        b) Vacuum Pump
        c) Compare reciprocating & rotary compressor
        d) Evaporative condenser.

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