

turbine is 1190 kg/hr. Determine the following :

- (i) Blade angle
- (ii) Blade efficiency
- (iii) Power developed
- (vi) Tangential force on the blade
- (v) Relative velocity of steam entering the blade.

Take blade velocity coefficient as 0.8. **12**

6. (a) Explain the various elements of condensing plant. Also discuss the various types of condenser. **8**
- (b) A close vessel of  $0.7 \text{ m}^3$  capacity contains saturated water vapour and air at a temperature of  $42.7^\circ\text{C}$  and a pressure of 0.13 bar. Due to further air leakage into the vessel, the pressure rise to 0.28 bar and the temperature fall to  $37.6^\circ\text{C}$ . Calculate the mass of air which has leaked in. Take  $R = 287 \text{ J/kgK}$  for air. **12**

## W-334

### B. Tech. (Weekend)

### EXAMINATION, May 2018

(Third Semester)

(Re-appear Only)

(CE)

MEW207

### ENERGY CONVERSION

*Time : 3 Hours]*

*[Maximum Marks : 100*

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Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

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**Note :** Attempt any *Five* questions.

1. (a) Classify the various types of fuels. **8**

- (b) The average volumetric analysis of dry flue gases in a boiler trail are as :
- $\text{CO}_2 = 8.5\%$ ,  $\text{CO} = 2.5\%$ ,  $\text{O}_2 = 7\%$  and  $\text{N}_2 = 82\%$ . The ultimate analysis of the coal supplied to the boiler is  $\text{C} = 80\%$ ,  $\text{H}_2 = 6\%$ ,  $\text{O}_2 = 7\%$  and the remaining is ash. Determine :
- The weight of the dry flue gas per kg. of fuel.
  - the weight of air supplied per kg. of fuel.
  - percentage of excess air supplied.
- Air containing 23% of  $\text{O}_2$  by mass. **12**
2. (a) What is Boiler ? Discuss the various types of mounting and accessories of boiler. **10**
- (b) What are high pressure boilers ? How do they differ in construction and working principles ? Sketch and describe Benson Boiler. **10**

3. Derive the expression for the efficiency of Carnot cycle. Also represents it on T-s and p-V diagram. **20**
4. (a) Derive a relation in between the area, velocity and pressure in nozzle flow. **10**
- (b) A stream turbine nozzle supply dry saturated steam at a pressure of 12 bars. The pressure at the outlet is 1 bar. The turbine has two nozzles with a through diameter of 3.5 mm. Assuming nozzle efficiency as 90% and that of turbine rotor 35%, find the quality of steam used per hour and the power developed. **10**
5. (a) Differentiate between impulse and reaction turbine. **8**
- (b) In a impulse turbine steam is being issue from the nozzle with a velocity of 1045 m/s. The nozzle angle is  $20^\circ$ , the mean blade velocity is 460 m/s and the inlet and outlet angles of the blade equal. The mass of the steam flowing through the

7. (a) Explain the construction and working a single stage reciprocating air compressor.

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- (b) A single stage reciprocating compressor takes  $1 \text{ m}^3$  of air per minute at 1.013 bar and  $15^\circ\text{C}$  and deliver it at 7 bar. Assuming that the law of compression is  $pV^{1.35} = \text{constant}$ , and the clearance is negligible, calculate the indicated power.

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8. Explain the following : **20**

- (i) Velox Boiler
- (ii) Rankine Cycle
- (iii) Governing of Steam Turbine.

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