

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem-VI Examination May 2011****Subject code: 161805****Subject Name: Applied Thermodynamics-II****Date: 23/05/2011****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Draw a neat diagram of vapour compression refrigeration system and explain its working. **07**
 (b) What are the different methods of compounding of steam turbine stages? List advantages and limitations of velocity compounding. **07**
- Q.2** (a) What are the effects of friction on the flow through a steam nozzle? Explain with the help of h-s diagram. **07**
 (b) Explain Supersaturated or metastable flow through nozzle. **07**
- OR**
- (b) Explain various methods of improving C.O.P. **07**
- Q.3** (a) Explain comparison between impulse and reaction steam turbine. **07**
 (b) State and explain Fourier's law of heat conduction. **07**
- OR**
- Q.3** (a) Determine the rate of heat flow through the boiler wall made of 2 cm thick steel and covered with an insulating material of 0.5 cm thick. **07**
 Take $K(\text{steel}) = 58 \text{ W/mK}$ and $K(\text{insulation}) = 0.116 \text{ W/mK}$.
 The temperatures at the inner and outer surfaces of the wall are 300°C and 50°C respectively.
 (b) Explain reversed Carnot cycle on p-v diagram. **07**
- Q.4** (a) A carnot refrigerator requires 1.25 kW per ton of refrigeration to maintain the temperature of 243K. Find (i) C.O.P. of Carnot refrigerator (ii) Temperature at which heat is rejected. **07**
 (b) Explain (i) Grey body (ii) Black body. **07**
- OR**
- Q.4** (a) Classify heat exchangers according to the directions of the fluid and give few examples of each in actual field of application. **07**
 (b) Explain effect of dissociation on I.C. Engines. **07**
- Q.5** (a) Explain Prandtl No., Reynolds No. and Grashof No. **07**
 (b) Explain difference between natural and forced convection. **07**
- OR**
- Q.5** (a) During a trial on a boiler, the dry flue gas analysis by volume was obtained as $\text{CO}_2=13\%$, $\text{CO}=0.3\%$, $\text{O}_2=6\%$, $\text{N}_2=80.7\%$. The coal analysis by weight was reported as $\text{C}=62.4\%$, $\text{H}_2=4.2\%$, $\text{O}_2=4.5\%$, moisture 15% and ash 13%. Estimate (i) Theoretical air required to burn 1 kg of coal (ii) Mass of air actually supplied per kg of coal (iii) The amount of excess air supplied per kg of coal burnt. **07**
 (b) State and explain Stephen-Boltzmann law of radiation. **07**
