



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 140408

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15 APPLIED THERMODYNAMICS

Time : 3 Hours]

[Total Marks : 100

1 Attempt any four parts : 5×4=20

- (a) What is the difference between path function and point function, explain using p-v diagram. What is the work done in free expansion process ?
- (b) Describe the steady flow energy equation for a single stream entering and leaving a control volume also explain the various terms involved. Give the differential from S.F.E.E. Also define unsteady flow process.
- (c) What does the Clausius-Clapeyron equation signify ? Derive and discuss its applications.
- (d) Define the following :
 - (i) Coefficient of volume expansion
 - (ii) Isothermal compressibility and
 - (iii) Adiabatic compressibility

- (e) How regeneration in gas turbines increases thermal efficiency of the plant ?
- (f) Discuss the effect of temperature on standard heat of reaction.

2 Attempt any two questions : **10×2=20**

- (a) What are boilers ? How are they classified ? Differentiate between mounting and accessories.
- (b) What do you understand by boiler draught ? Calculate condition for maximum discharge.
- (c) Determine equivalent evaporation/kg of fuel and boiler efficiency of a boiler having steam generation at 3 mpa, 350°C at a rate of 4×10^4 kg/hr. Feed water enters economizer at 100°C and during one hour test 5×10^3 kg fuel of $C_v = 3.5 \times 10^4$ kJ/kg is consumed.

3 Attempt any two questions : **10×2=20**

- (a) Draw P-V and T-S diagram for a Rankine cycle. Derive expression for work done and efficiency of cycle. Explain how it is different from modified Rankine cycle.
- (b) Dry saturated steam at pressure of 6 bar flows through converdiver nozzle at rate of 4.5 kg/sec and exit pressure as 1.6 bar loss due to friction occurs in divergent section at 12% as friction drop. Determine cross section of exit and throat area.

- (c) Explain the following :
- (i) Saturation curve
 - (ii) Indicated power
 - (iii) Metastable state flow through nozzle
 - (iv) Brake power
 - (v) Missing quantity
- 4 Attempt any two questions : **10×2=20**
- (a) (i) Enumerate effect of pressure and temp. on Rankine cycle.
 - (ii) What is bleeding and how does it affects cycle efficiency ?
 - (b) Draw velocity diagram for velocity compounded turbine and find equation for maximum work done and efficiency.
 - (c) Define steam turbines and classify them. Explain the term compounding and its types in brief.
- 5 Attempt any two questions : **10×2=20**
- (a) Explain in brief methods of improving efficiency of open cycle gas turbine.
 - (b) Explain Brayton cycle and obtain expression for efficiency in terms of pressure and temp ratio.
 - (c) Explain working of jet propulsion system and compare working of Ram jet with Pulse jet engines.