



Register Number:

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

AUTOMOBILE ENGINEERING

U13AUT302: Thermodynamics and Thermal Engineering

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Zeroth law of thermodynamics forms the basis of _____ measurement.
a) Pressure b) Temperature c) Heat exchange d) Work
2. The polytropic process $p v^n = \text{constant}$ for which the index 'n' equal infinity represents a _____ process.
3. The ideal constant pressure gas turbine works on _____ cycle
4. For a particular diesel engine cycle, the compression ratio and expansion ratio respectively stated to be 21:1 and 10.5:1. The corresponding cut off ratio will be
a) 0.5 b) 1.5 c) 2 d) 4
5. Triple point is the point where _____ exists together.
6. At critical point, the enthalpy of vaporization is _____
a) zero b) maximum c) minimum d) dependent on temperature only
7. A human body feels more comfort when the heat produced due to metabolism of human body is equal to _____
8. Which is usually the costliest item in a refrigeration system?
a) condenser b) capillary tube c) evaporator d) compressor

c-d	-2100	-	-36600
d-a	-	-	-

(OR)

b) (i) Define the kelvin – planck and clausius statement of the second law of thermodynamics. (4)

(ii) A perfect gas flows through a nozzle where it expands in a reversible adiabatic manner. The inlet conditions are 22bar, 500⁰C, 38m/s. At exit the pressure is 2 bar. Determine the exit velocity and exit area if the flow rate is 4kg/s. (Take R=190J/kgK and Y =1.35) (10)

23. a) (i) A single stage, single acting reciprocating air compressor has a bore of 200mm and a stroke of 300mm. It receives air at 1 bar and 20°C and delivers at 5.5 bar. If the compression follows the law $pV^{1.3} = C$ and clearance volume is 5 percentage of the stroke volume. Determine

1. Effective Pressure

2. Power Required to drive the compressor if runs at 500 rpm.

(ii) Define the following terms in relation to reciprocating engines: Dead centre, Stroke length, piston speed, compression ratio and mean effective pressure. (10)

(OR)

b) Explain the process involved in otto cycle. Show that thermal efficiency of an otto cycle engine depends upon compression ratio and adiabatic index.

24. a) Describe with a neat schematic arrangement, the working of a simple vapour compression refrigeration cycle. Represent the cycle on P-V and T-S plots.

(OR)

b) (i) List the properties of ideal refrigerants. (7)

(ii) What is comfort air conditioning? Explain types of air conditioning system. (7)

25. a) (i) Show that heat conduction through a plane wall is $Q = \frac{T_1 - T_2}{R}$ with its neat sketch. (7)

(ii) Derive that heat conduction through a cylinder. (7)

(OR)

b) Find the convective heat loss from a radiator 0.5m wide and 1.5m high maintained at a temperature of 90° C in a room at 20°C. Consider the radiator as a vertical plate.
