B. TECH. SEM - III (PRODUCTION ENGG.) (2014 COURSE) (CBCS)
: WINTER - 2017
SUBJECT: APPLIED THERMODYNAMICS

Day: **Monday** Time: **10.00 AM TO 01.00 PM**
Date: **22/01/2018** **W-2017-2055** Max Marks: 60

N.B:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non- programmable **CALCULATOR** is allowed.
4) Use of steam table is allowed.
5) Assume suitable data if necessary.

Q.1 **a)** Prove that violation of Kelvin- Planck statement leads to violation of clausius statement. **(05)**

b) Explain energy balance and boiler draught in detail. **(05)**

OR

Q.2 **a)** A domestic food freezer maintains a temperature of -15^0c. The ambient temperature is 30^0c. The heat leaks into the freezer at 1.75 KJ/S. What is the minimum power necessary to pump? **(05)**

b) Explain the working of a water level indicator with neat diagram. **(05)**

Q.3 **a)** What are the alternative refrigerants? Describe desirable properties of refrigerants. **(05)**

b) DBT and WBT of atmospheric air at 1 atmosphere are 25 and 15^0c respectively. Determine i) specific humidity b) relative humidity iii) enthalpy of air **(05)**

OR

Q.4 **a)** Explain humidification and dehumidification with neat sketch. **(04)**

b) The vapor compression refrigerator cycle works between temperature limits of 25^0c and -10^0c. The vapour at the end of isentropic compression is just dry. Find the cop of then system the properties of refrigerant area tabulated below. **(06)**

Temperature K	Enthalpy hf	hg	Entropy K J /kg K
298 k	298.9	1465.84	1.1242
263	135.37	1433.05	0.5443

Q.5 **a)** Explain construction and working of multistaging of air compressor with neat sketch. **(05)**

b) In a three- stage compressor, air is compressed from 98 kPa to 20 bar. Calculate for $1m^3$ of air per second. **(05)**

i) Work under ideal condition for n= 1.3
ii) Isothermal work
iii) Saving in work due to multi- staging

OR

Q.6 **a)** Compare reciprocating and rotary compressor. **(06)**

b) Estimate the work done by a stage reciprocating single acting air compressor to compress2.8 m^3 of air per minute at 1.05 bar and 10^0c to final pressure of 35 bar. The intermediate receiver cools air to 30^0c and 5.6 bar pressure, for air, take n= 1.4 **(04)**

Q.7 **a)** An oil engine, working on the dual combustion cycle, has a compression ratio 10 and cut- off takes place at 1/10 of the stroke. If the pressure ate the beginiging of compression is 1 bar and maximum pressure 40 bar determine the air standard efficiency of the cycle, take r=1.4 **(06)**

b) Give assumptions of air standard cycles. **(04)**

OR

Q.8 **a)** Derive an expression for thermal efficiency of Otto cycle. **(05)**

b) Derive an expression for thermal efficiency of dual cycle. **(05)**

Q.9 **a)** Explain with neat sketch the operation of a simple float type carburetor. **(05)**

b) Discuss cooling systems of I.C. engine in detail. **(05)**

OR

Q.10 **a)** A single cylinder CI engine with a brake thermal efficiency of 30% uses diesel oil having a calorific value of 42,000 KJ/kg. If its mechanical efficiency is 80% calculate **(05)**
i) BSIC ii) ISFC iii) Thermal efficiency

b) Explain types of nozzles. **(05)**

Q.11 **a)** Explain heat transfer through extended surfaces with their types in detail. **(05)**

b) Explain use of log mean temperature differentiate (LMTD) in detail. **(05)**

OR

Q.12 **a)** Explain effectiveness of NTU method for parallel How? **(05)**

b) Explain effectiveness and efficiency of a fin in detail. **(05)**

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