Code No: RT21022 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, May/June - 2017
THERMAL AND HYDRO PRIME MOVERS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Explain the principle of carburetion. (5M)
   b) Ten kg of water at 45^0C is heated at constant pressure of 10 bar until it becomes superheated vapor at 300^0C. Find the changes in volume, enthalpy, internal energy and entropy. (5M)
   c) Enumerate the various uses of gas turbines. (3M)
   d) Define Manometric efficiency of a centrifugal pump (3M)
   e) Define Volumetric efficiency of a turbine? (3M)
   f) What do you understand by capacity factor? (3M)

PART –B

2. a) Mention the various parameters which affect the engine heat transfer and explain their effect. (8M)
   b) Clearly explain the various desired properties of a lubricant and explain how additives help to achieve the desired properties. (8M)

3. a) With the help of T-S diagram explain the effect of following variables on the efficiency and power output of a Rankine cycle: (7M)
   i) condenser pressure ii) boiler pressure.
   b) Steam with absolute velocity of 300 m/s is supplied through a nozzle to a single stage impulse turbine. The nozzle angle is 25^0. The mean diameter of the blade rotor is 1 meter and it has a speed of 2000 rpm. Find suitable blade angles for zero axial thrust. If the blade velocity coefficient is 0.9 and the steam flow rate is 10 kg/s, calculate the power developed. (9M)
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4. a) Explain why a low pressure ratio is used in gas turbines compared with I.C. engine. What is the range? (7M)
   b) A closed cycle gas turbine consists of a two- compressor and a two-stage turbine. All the components are mounted on the same shaft. The pressure and temperature at the inlet of the first stage compressor are 2 bar and 25^0C. The maximum cycle temperature and pressure are limited to 850^0C and 8 bar. A perfect cooler is used between the two compressors and a reheater is used between the two turbines. Gases are heated in the reheater to 850^0C before entering into the L.P turbine. Assuming the compressor and turbine efficiencies is 0.83, find i) the cycle efficiency without regenerator, ii) with regenerator whose effectiveness is 0.65, and iii) if the I.P. developed by the plant is 310 kW. Find the mass of the fluid circulated. Air is used in the cycle as working fluid Υ=1.4 and C_p=1 kJ/kg-K. (9M)

5. a) Derive the expression for force and work done per second by the jet when it strikes the inclined plate moving in the direction of the jet. (8M)
   b) Why does a centrifugal pump get its name? Explain the working of a centrifugal pump with a neat diagram showing different parts. (8M)

6. a) With the help of a neat diagram, explain the construction and working of a Kaplan turbine. (7M)
   b) A pelton wheel having a mean bucket diameter of 1.0 m is running at 1000 rpm. The side clearance angle is 15^0 and discharge through the nozzle is 0.1 m^3/s. Determine the power available at the nozzle and hydraulic efficiency of the turbine. (9M)

7. a) What is hydroelectric power station? What are its elements? Discuss them one by one elaborately with neat sketches. (8M)
   b) Explain power duration curve in detail. (8M)