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

II B. Tech I Semester Supplementary Examinations, May/June - 2016
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) What do you mean by pre-ignition? How can it be detected?   (4M)
    b) Define a steam turbine and state its fields of application.   (4M)
    c) Enumerate the various uses of gas turbines.   (4M)
    d) Explain different types of pumps?   (4M)
    e) What is governing and how it is accomplished for different types of water   (3M)
       turbines?
    f) Describe the advantage of Hydropower over Thermal power?   (3M)

PART –B

2. a) With neat sketch explain the Battery ignition system.   (8M)
    b) Following observations were recorded during a test on single-cylinder oil   (8M)
       engine:
       Bore = 300 mm; stroke = 450 mm; speed = 300 r.p.m. ; i.m.e.p = 6 bar ;
       Net brake load = 1.5 kN ; brake drum diameter = 1.8 meters;
       Brake rope diameter = 2cm. Calculate: i) Indicater power; ii) Brake power;
         iii) Mechanical efficiency.

3. a) Define the following as related to steam turbines.   (8M)
         i)   Speed ratio   ii) Blade velocity co-efficiency.
         ii)   Diagram efficiency   iv) Stage efficiency
    b) A simple Rankine cycle works between pressure of 30 bar and 0.04 bar, the   (8M)
       initial condition of steam being dry saturated, calculate the cycle efficiency,
       work ratio and specific steam consumption

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4. a) State the merits of gas turbine over I.C. engine and steam turbines. Discuss also the demerits over gas turbines. (8M)

    b) A gas turbine has a pressure ratio of 6/1 and a maximum cycle temperature of 600 °C. The isentropic efficiencies of the compressor and turbine are 0.82 and 0.85 respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15°C at the rate of 15 kg/s. (8M)

    Take c_p = 1.005 kJ/kg K. and γ = 1.4 for the compression process, and take c_p = 1.11 kJ/kg K. and γ = 1.333 for the expansion process

5. a) A 15 cm diameter jet of water with a velocity of 20 m/sec strikes a plate normally. If the plate is moving with a velocity of 8m/sec in the direction of the jet, calculate the work done per second on the plate and the efficiency of the energy transfer. (8M)

    b) Prove that the force exerted by a jet of water on a fixed hemispherical curved vane when the jet strikes at the centre is F = $\rho a v^2$ where (8M)

    ρ = Mass density of water
    a = Area of cross section of the jet
    v = Velocity of the jet

6. a) How will you classify the turbines? Explain (8M)

    b) A Pelton wheel is to be designed for the following specifications. (8M)

    Power =735.75 kW S.P. Head = 200 m, Speed = 800 r.p.m., η_0 = 0.86 and jet diameter is not to exceed one-tenth of the wheel diameter. Determine:
    i) Wheel diameter,
    ii) The number of jets required, and
    iii) Diameter of the jet. Take Cv = 0.98 and speed ratio = 0.45.

7. a) Describe the status of hydroelectric power in India (8M)

    b) Explain how the load factor, capacity factor and utilization factor interrelated. Also explain the significance of diversity factor. (8M)