

II B. Tech I Semester Supplementary Examinations, October/November - 2019**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****PART -A**

1. a) Explain the various frictional losses in an engine. (4M)
- b) 0.08 kg of steam is heated of constant pressure of 2 bar until the volume occupied is 0.10528 m^3 . Calculate i) heat supplied and ii) work done (5M)
- c) What do you mean by the term 'gas turbine'? How are gas turbines classified? (4M)
- d) What do you understand by Manometric head of a centrifugal pump? (3M)
- e) Define Hydraulic efficiency of the turbine. (3M)
- f) What do you understand by diversity factor? (3M)

PART -B

2. a) Explain Thermo-syphon cooling system in detail? (8M)
- b) With a neat sketch explain the magneto ignition system. (8M)
3. a) Explain velocity compounded impulse steam turbine showing pressure and velocity variations along the axis of the turbine. (7M)
- b) A steam turbine in a Rankine cycle receives steam at a pressure of 20 bar and superheated to 88.6°C . The exhaust pressure is 0.07 bar and the expansion of steam is isentropic. Calculate i) heat supplied ii) heat rejected iii) net work done iv) work done by the turbine v) thermal efficiency vi) theoretical steam consumption. (9M)
4. a) Describe with the neat sketches the working of a simple constant pressure open cycle gas turbine. How does the actual cycle differ from the theoretical cycle? (7M)
- b) In an open constant pressure gas turbine, air enters the compressor at 1.02 bar and 27°C . The pressure of air after the compression is 4.08 bar. The isentropic efficiencies of compressor and turbine are 80% and 85% respectively. The air fuel ratio used is 80:1. Find the I.P. and thermal efficiency of the cycle if the flow rate of air is 2.5 kg/sec. take $C_p=1 \text{ kJ/kg-K}$ and $\gamma=1.4$ for air and gases. Calorific value of fuel used= 41720 kJ/kg . (9M)
5. a) A 10 cm diameter jet of water exerts a force of 2 kN in the direction of flow against a stationary flat plate which is inclined at an angle of 30° with the axis of the stream. Find, i) Force normal to the plate, ii) Velocity of the jet, iii) Mass flow rate of water kg/sec. (8M)
- b) A centrifugal pump is running at 1000 rpm. The outlet vane angle of the impeller is 45° and the velocity of flow at the outlet is 2.5 m/s. The discharge through the pump is 200 litres/sec when the pump is working against a total head of 20 m and. (8M)

6. a) Explain the different characteristic curves for a hydraulic turbine. (7M)
- b) A pelton wheel turbine develops 9000 kW under a head of 300 m. the turbine speed is 550 rpm and ratio of jet diameter to wheel diameter is 1/10. The hydraulic, volumetric and mechanical efficiencies are 0.98, 0.95 and 0.92 respectively. The speed ratio is 0.46 and coefficient of velocity is 0.98. Calculate the number of jets to be provided. (9M)
7. a) Explain firm power and secondary power in detail. (8M)
- b) Show that capacity factor is equal to the product of the load factor and the utilization factor. (8M)

