

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: 151906****Date: 23-05-2013****Subject Name: Conventional Power Engineering****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) With a neat sketch explain the general layout of modern thermal power plant with different circuits. **07**

(b) Derive an expression for efficiency of Rankine cycle. **07**

Q.2 (a) State the reasons for compounding of steam turbine. Explain velocity compounding. **07**

(b) Prove that the condition for maximum efficiency for Parson turbine is **07**

$$(\eta)_{\max} = \frac{2\cos^2 \alpha}{1+\cos^2 \alpha}$$

OR

(b) The steam is supplied to a De-Laval turbine at a velocity of 1000 m/s at an angle of 20°. The blade velocity is 300 m/s and the blades are symmetrical. The mass-flow rate of steam is 0.5 kg/sec. Allowing a friction factor of 0.8, determine, **07**

- (i) blade efficiency
- (ii) power developed
- (iii) stage efficiency if the nozzle efficiency is 95 %.

Q.3 (a) State the advantages and disadvantages of closed cycle over open cycle gas turbine plant. **07**

(b) Draw a outline diagram of a diesel power plant. Explain any one system of diesel power plant. **07**

OR

Q.3 (a) State the various methods of improving efficiency and work output of a simple gas turbine plant and discuss any one of them. **07**

(b) A gas turbine unit has a pressure ratio of 6 and maximum cycle temperature of 610°C. The isentropic efficiency of the turbine and compressor are 0.82 and 0.8 respectively. Calculate the power output in KW when the air enters the compressor at 15°C at a rate of 16 kg/s. Take $C_p = 1.005$ KJ/kg K and $\gamma = 1.4$ for compression process and $C_p = 1.11$ KJ/kg K and $\gamma = 1.333$ for expansion process. **07**

Q.4 (a) With a neat sketch explain working of Pelton wheel. **07**

(b) Draw a neat sketch of a nuclear reactor stating functions of each component. **07**

OR

Q.4 (a) Write a note on boiling water reactor. **07**

Q.4 (b) Write a note on nuclear waste and its disposal. **07**

Q.5 (a) Explain the phenomenon of cavitation in hydraulic turbine. **07**

(b) Explain the following terms **07**

- (i) Plant capacity factor
- (ii) Diversity factor
- (iii) Load duration curves
- (iv) Demand factor

OR

Q.5 (a) Write a note on fast breeder reactor. **07**

- (b) A power station is to supply three industrial loads, whose peak loads are 60 MW, 40 MW and 25 MW. The annual load factor is 0.6 and diversity factor is 1.8. Estimate the following : **07**
- (i) Maximum demand on the plant
 - (ii) Installed capacity
 - (iii) Annual energy generated
