

Code: 9A03501

R9

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

THERMAL ENGINEERING - II

(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 A steam power plant operates on a theoretical reheat cycle. Steam at boiler at 150 bar, 550°C expands through the high pressure turbine. It is reheated at a constant pressure of 40 bar to 550°C and expands through the low pressure turbine to a condenser at 0.1 bar. Draw T-s and h-s diagrams.
Find: (i) Quality of steam at turbine exhaust.
(ii) Cycle efficiency. (iii) Steam rate in kg/KW hr.
- 2 (a) Explain the construction and working of a simple vertical boiler with a neat sketch.
(b) A boiler evaporates 8 kg of water per kg of coal into dry saturated steam at 10 bar pressure. The feed water temperature is 46°C. Find the equivalent evaporation from and at 100°C. Also calculate the factor of evaporation.
- 3 Define nozzle efficiency. Explain the effect of friction on the performance of the nozzle with the help of h-s diagram.
- 4 A stage in an impulse turbine consists of converging nozzles and one ring of moving blades. The nozzle angles are 22° and the moving blades have both tip angles of 35°. If the velocity of steam at nozzle exit is 450 m/s, find the blade speed so that the steam shall pass on to the blades without shock and find the stage efficiency, neglecting frictional losses, if the blades run at the end thrust on shaft if power developed is 36.8 KW.
- 5 Show that for maximum diagram efficiency of a reaction turbine the blade-steam speed ratio is equal to $\cos \alpha$, where α is the angle of absolute velocity at inlet. State the assumption made. Hence derive an expression for maximum efficiency.
- 6 A prime mover uses 15000 kg of steam per hour and develops 2450 KW. The steam is supplied at 30 bar and 350°C. The exhaust from the prime mover is condensed at 725 mm of Hg when barometer records 755 mm of Hg. The condensate temperature from the condenser is 31°C and the rise of temperature of circulating water is from 8°C to 18°C.
Determine: (i) The quality of steam entering the condenser.
(ii) The quantity of circulating cooling water and the ratio of cooling.
- 7 (a) What are the applications of the gas turbine plants?
(b) Define isothermal efficiency of a compressor and prove that the isothermal work input to a compressor is always minimum.
- 8 Define the principle of jet engine. List the different types of jet engines.
