B.Tech Sem – VIII (2007 Course) (Mechanical Engg.) :
WINTER - 2017
SUBJECT: POWER PLANT ENGINEERING

Day: **Wednesday** Time: **02.30 PM TO 05.30 PM**
Date: **22/11/2017** **W-2017-2693** Max. Marks: 80

N.B.:

1) **Q. No. 1** and **Q. No. 5** are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer books.
4) Use of **Mollier chart** and **steam tables** is allowed.
5) Use of non programmable **CALCULATOR** is allowed.
6) Assume suitable data if necessary.

SECTION-I

Q.1 **a)** Explain co-generation plant with neat sketch. **(04)**

b) Sketch the neat diagram of regenerative gas turbine plant and deduce an expression for its thermal efficiency. **(05)**

c) Draw the schematic for an ideal Rankine cycle. Draw P-V, T-S and h-s diagrams for this cycle. **(05)**

Q.2 **a)** An ideal gas turbine cycle with two stages of compression and two stage of expansion has an overall pressure ratio of 8. Air enters the each stage of compressor at 300 K and each stages of turbine at 1300 K. Determine the back work ratio and thermal efficiency of the gas turbine cycle. Assuming an ideal generator with 100 percent effectiveness. **(07)**

b) Explain the working of a turbojet engine with the help of a sketch. What are the advantages, disadvantages and applications? **(06)**

Q.3 **a)** Explain the working of diesel power plant with neat sketch. **(06)**

b) What do you mean by Fission of nuclear fuel? Enumerate and explain essential components of a nuclear reactor. **(07)**

Q.4 **a)** An ideal regenerative steam cycle operates with the steam entering the turbine at 30 bar and 500^0C and is exhausted at 0.1 bar. A feed water heater is used. Which operates at 5 bar. Calculate: **(07)**
i) the thermal efficiency
ii) Steam rate of the cycle
iii) Average temperature of heat addition

b) A steam power plant works between pressure of 40 bar and 0.05 bar. If the steam supplied is dry saturated and the cycle of operation is Rankine cycle find: **(06)**
i) Cycle efficiency
ii) Specific steam consumption

P. T. O.

SECTION-II

Q.5 **a)** Distinguish between impulse and reaction turbines. **(04)**

b) Derive an equation for discharge through the nozzle. **(05)**

c) Define 'diversity factor' and state the advantages of diversity of load in a power system. **(05)**

Q.6 **a)** What is the pressure velocity compounding? Write the advantages. **(06)**

b) The nozzles of a de- laval turbine deliver 1.5 kg/ s of steam at a speed of 800m/s to a ring of moving blades having a speed of 200m/s. The exit angle of the nozzle is 18^0. If the blade velocity coefficient is 0.75 and the exit angle of the moving blades is 25^0. Calculate: **(07)**

i) Inlet angle of moving and fixed blades
ii) Diagram efficiency
iii) Energy lost in blades per second.

Q.7 **a)** A nozzle is to be designed to expand steam at the rate of 0.10 kg/s from 500 kPa, 210^0C to 100 kPa. Neglect inlet velocity of steam. For a nozzle efficiency of 0.9. Determine the exit area of the nozzle. **(07)**

b) Explain the working of a shell and tube type surface condenser. **(06)**

Q.8 **a)** A 60 MW power station has an annual peak load of 50 MW. The power station supplies loads having a maximum demands of 20 MW, 17 MW, 10 MW and 9 MW. the annual load factor is 0.45. Find: **(07)**

i) Average load
ii) Energy supplied per year
iii)Diversity factor
iv) Demand factor.

b) Explain load curves, load duration curves connection load maximum load, and peak load. **(06)**

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