6th Semester Regular / Back Examination 2018-19
POWER PLANT ENGINEERING
BRANCH : MECH
Time : 3 Hours
Max Marks : 100
Q.CODE : F908
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
from Part-III.
The figures in the right hand margin indicate marks.Use of Steam table and Refrigeration
table are allowed in the examination hall.

Part- I

Q1   **Short Answer Type Questions (Answer All-10)**   (2 x 10)
   a)   What are effects of regeneration and reheat on efficiency and work output of the power plant.
   b)   What is the function of economizer and air preheater?
   c)   Define the term "Breeding"
   d)   What are the micro hydel plants? Why are they important now days?
   e)   What are the major factors that decide the economics of power plants?
   f)   What is the use of load curves in power plants?
   g)   What are the advantages of super critical boiler over critical boilers?
   h)   List out the inherent advantages of the combined power cycles.
   i)   Differentiate condenser efficiency and vacuum efficiency?
   j)   Write one relative merit and one demerit of ID fan over FD fan.

Part- II

Q2   **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 x 8)
   a)   How are nuclear reactor classified? Discuss fast breeder reactor.
   b)   Write a short note on Peak load, Demand factor and Load factor
   c)   What is a moderator? Name the common moderators and discuss their relative advantages and disadvantages.
   d)   Give the functions and materials for the followings :
            (i) reflector (ii) control rods (iii) biological shield
   e)   How waste is disposed off in nuclear power station? What are the main difficulties in handling radioactive waste?
   f)   Explain the principle involved in design of chimney.
   g)   Why are the steam turbines compounded? What are the different methods of compounding?
   h)   Define (i) approach (ii) range (iii) cooling efficiency of a cooling tower
   i)   Draw the neat diagram of hyperbolic cooling tower and discuss its merit and demerits.
   j)   Give a short note on Water treatment systems.
   k)   5400 kg of steam is produced per hour at a pressure of 7.5 bar in aboilerwith feed water at 41.5°C. The dryness fraction of steam at exit is 0.98. The amount of coal burnt per hour is 670 kg of calorific value 31000 kJ/kg. Determine the boilern efficiency and equivalent of evaporation.
   l)   Explain Super saturated flow in nozzle.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 In a cogeneration plant, the power load is 5.6 MW and the heating load is 1.163 MW. **(16)** Steam is generated at 40 bar and 500°C and is expanded isentropically through a turbine to a condenser at 0.06 bar. The heating load is supplied by extracting steam from the turbine at 2 bar, which is condensed in the process heater to a saturated liquid at 2 bar and then pumped back to the boiler. Compute :
  a) The steam generation capacity in the boiler.
  b) The heat input to the boiler
  c) The fuel burnig rate
  d) The heat rejected to the condenser
  e) The rate of flow of cooling water in the condenser if the temperature rise of water is 6°C. Neglect pump work.

Q4 The following particulars apply to a two-row velocity compounded impulse wheel : **(16)**
Steam velocity at nozzle exit =500 m/s
Nozzle angle=16°
Mean blade velocity=120 m/s
Exit angles: first row moving blades =18°, fixed guide blades=22°, second row moving blades=36°
Steam flow=5 kg/s
Blade friction coefficient=0.85
Determine :
a) the tangential thrust
b) the axial thrust
c) the power developed
d) the diagram efficiency

Q5 In a reaction turbine, the blade tips are inclined at 35° and 20° in the direction of **(16)** motion. The guide blades are of the same shape as the moving blades, but reversed in direction. At a certain place in the turbine, the drum diameter is 1 meter and blades are 10 cm high. At this place the steam has a pressure of 1.75 barand dryness fraction of 0.935. if the speed of this turbine is 250 r.p.m and the steam passesthrough the blades without shock, find the mass of the steam flow and power developed in the ring of moving blades.

Q6 Differentiate between Jet condenser and surface condenser. **(16)**

A surface condenser deals with 13625 kg of steam per hour at a pressure of 0.09 bar. The steam enters 0.85 dry and the temperature at the condensate and air extraction pipes is 36°C. The air leakgae amounts to 7.26 kg/hour. Determine (i) the surface required if the average heat transmission rate is 4 kJ/cm^2 per second (ii) the cylinder diameter for the dry air pump, if it is to be single acting at 60 rpm with stroke to bore ratio 1.25 and volumetric efficiency of 0.85