Registration No: | | | | | | | | | | |

Total Number of Pages: 2

M.TECH
HTPE211

2nd Semester Regular/Back Examination – 2015-16
POWER PLANT PRACTICE AND CONTROL
Q. Code : W805
Time : 3 Hours
Max Marks: 70

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) What do you mean by pinch point and write its significance?
b) What is repowering and give example of it?
c) What do you mean by carry-over efficiency and write it's significance
d) What do you mean by Nuclear density and how to find ir?
e) What is pendant superheater?
f) What do you mean deaeration?
g) What do you mean by critical velocity in fluidized bed combustion?
h) What is 1/V law and 1/V region?
i) Which reactor has been selected under India's nuclear power programme and why?
j) What is balanced draught? What is its significance?

Q2 a) A typical modern gas turbine used in combined cycle application would have an exhaust temperature of around 600^{o}C and a thermal efficiency of about 34%. The stack temperature is 120^{o}C when the fuel was natural gas, high has a very low sulphur content. A single pressure steam cycle might give around 32% thermal efficiency. Assume ambient temperature is 15^{o}C.calculate the overall efficiency. (5)

b) Show the slopes of the input-output curve for each unit must be equal for minimum combined input to carry a given combined output. (5)

Q3 a) The ultimate analysis of a fuel oil is given to be: carbon 83.7%, hydrogen 12.7%, sulphur 0.7%, nitrogen 1.7%, & oxygen 1.2%. The combustion air has a dry bulb temperature of 27^{o}C and a wet bulb temperature of 21^{o}C. With 30% excess air and assuming complete combustion, find (a) the total volume of combustion products at 200^{o}c and 1.013bar, and (b) the dry flue gas analysis based on CO_2, O_2 and N_2 (5)

b) Write down detail about kinetics of combustion reaction and its control. (5)

Q4 a) A fluidized bed combustion system having an output of 35MW at 80% efficiency when using a coal of heating of value 26MJ/kg with a sulphur content of 3.6% requires a particular limestone to be fed to it at a (5)

calcium-sulphur ratio of 3.0, so as to limit emissions of SO_2 adequately. The limestone used contains 85% $CaCo_3$, determine the required flow rate of limestone

b) Discuss about steam generator control in detail (5)

Q5 (a) Water at 30^oC flows into a cooling tower at a rate of 1.15kg per kg air. Air enters the tower at the dbt of 20^oC and a relative humidity of 60% and leaves it at a dbt of 28^0C and 90% relative humidity. Makeup water is supplied at 20^0C. determine (a) the temperature of water leaving the tower, (b) the fraction of water evaporated and (c) the approach and the range of the cooling tower (5)

(b) Explain the operation of an elastic precipitator. (5)

Q6 (a) A reactor is fuelled with 100 tonnes of natural uranium (atomic mass 238.05) in which the average thermal neutron(2200 m/sec)flux is 10^{13} neutrons/cm^2s, the 2200 m/sec cross section of U-235(atomic mass 235.04) are; σ_f = 579$barns$ and σ_f = 101$barns$. the energy release per fission is 200MeV and 0.715% of natural uranium is U-235. Calculate (a) the rating of the reactor in MW/tone, (b) the rate of consumption of U-235 per day (5)

(b) Discus detail about Neutron Life cycle and Neutron flux (5)

Q7 (a) Write down the chemical methods to reduce emissions (5)

(b) Which undesirable emissions generated from combustion causes air pollution and write down the physics behind them. (5)

Q8 Explain any two of the following (5 x 2)

a) Coal liquefaction Vs Coal Gasification
b) Future energy systems
c) Acid rain and acid snow
d) Environmental audit