**Karunya University**

**(Karunya Institute of Technology and Sciences)**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examinations – June 2016**

**Subject Title: POWER PLANT ENGINEERING Time : 3 hours**

**Subject Code: 14ME2018 Maximum Marks: 100**

**Answer ALL questions (5 x 20 = 100 Marks)**

**Compulsory:**

1. a. Name the major pollutants discharged into the atmosphere from coal based thermal power plants. Enumerate the ill-effects caused to the humans by such pollutants. (7)

b. With neat sketches explain the construction and operation of electrostatic precipitators. (13)

2. On what thermodynamic cycle does a steam power plant operate? Explain using separate T-s diagrams how is the efficiency of the cycle increased by a) increasing boiler pressure b) decreasing condenser pressure and c) superheating steam.

**(OR)**

3. Steam at 35 bar and 300°C is supplied to a steam turbine. The exhaust pressure of the turbine is 0.1 bar. A single bleed is taken between the high pressure and low pressure of the turbine at 1.5 bar for regenerative feed heating. The isentropic efficiency for both sections of the turbine is 80%. The temperature of the bleed condensate coming out of the heat exchanger is 10°C lower than the temperature of the bleed steam. Find i) bleed steam per kg of steam supplied to the steam turbine and ii) the thermal efficiency of the plant. Neglect the losses and the pump work. The condensate coming out from heat exchanger and condenser are led to the hot well.

4. a. Explain with a neat sketch power generation using any one type of nuclear reactor. (10)

b. Describe the operation of open and closed cycle gas turbine power plants with neat sketches including p-V and T-s diagrams. (10)

**(OR)**

5. a. Air enters the compressor of a gas turbine power plant operating on Brayton cycle at 101.32 kPa, 27°C. The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the cycle efficiency. Assume turbine work to be 2.5 times the compressor work. Take γ=1.4. (10)

b. Describe the methods employed to improve the thermal efficiency of a simple open cycle constant pressure gas turbine power plant. (10)

6. a. Illustrate the construction and operation of a hydroelectric power plant. (15)

b. Enumerate the advantages of hydroelectric power plants compared with thermal power plants. (10)

**(OR)**

7. a. What are the various components in a diesel power plant? Explain the layout with a neat sketch. (10)

b. How are hydroelectric power plants classified according to the availability of head / quantity of water and nature of load? (10)

8 a. Explain any three methods of power generation using non-conventional energy sources.

(15)

b. What is the need for energy audit? Write brief notes on the procedure for energy audit. (5)

**(OR)**

9. a. Define the following: i. Capacity Factor ii. Demand Factor and iii. Diversity Factor. (6)

[P.T.O]

b. The maximum demand of a power station is 96000 kW. The daily load curve is tabled below:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time, Hrs | 0 -6 | 6 - 8 | 8 - 12 | 12 - 14 | 14 - 18 | 18 - 22 | 22 - 24 |
| Load, MW | 48 | 60 | 72 | 60 | 84 | 96 | 48 |

Construct the load curve and find load factor of the power station. If the loads above 72 MW are taken by a stand-by unit rated at 30 MW capacity, find the load factor and use factor of the stand-by unit. (14)