D 42524

(Pages : 2)

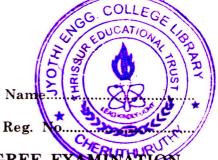Name..............................

Reg. No.............................

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2007

ME–04 701—POWER PLANT ENGINEERING

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*

Part A

I. (a) Mention the difference between the closed cycle and open cycle gas turbine power plants.

(b) What do you understand by co-generation of power and process heat ?

(c) What is a fusible plug ? Mention the working of it.

(d) Name the boiler mountings and accessories.

(e) What is compounding of steam turbines ? Name the different methods of compounding.

(f) Explain supersaturated expansion of steam through a nozzle.

(g) What is the function of pressurizer in a PWR ? Explain the characteristic feature of a PWR.

(h) What do you mean by depreciation ? Explain briefly any *one* method used to calculate the depreciation cost.

(8 × 5 = 40 marks)

Part B

2. In a cogeneration plant, the power load is 5.6 MW and the heating load is 1.163 MW. 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 and then pumped back to the boiler. Compute (a) steam generation rate ; (b) heat input to the boiler in kW. (c) the fuel burning rate of the boiler in t/h if the calorfic value of coal is 25 MJ/kg. and boiler efficiency is 85 % ; (d) the heat rejected to the condenser. Neglect pump work.

Or

3. (a) Explain the function of the deaerator why is deardrator installed at a larger height from the basement.

(8 marks)

(b) Discuss the advantages of combined cycle power generation.

(7 marks)

Turn over

4. (a) Explain the operation of a spreader stoker with the help of a neat sketch.   (8 marks)

   (b) Explain the operation of a spraytype desuperheater.   (7 marks)

Or

5. (a) Mention the merits and demerits of fire-tube boilers.   (7 marks)

   (b) What is a cooling tower ? How are cooling towers classified. Explain any one of them with a neat sketch.

   (8 marks)

6. (a) Derive an expression for critical pressure ratio for maximum discharge through a nozzle.

   (8 marks)

   (b) Show that in a 50 % reaction steam turbine stage, the maximum stage efficiency is $\dfrac{2\cos^2\alpha}{1+\cos^2\alpha}$, where α is the nozzle angle ?

   (7 marks)

Or

7. The following particulars apply to a two row velocity compounded impulse stage of a turbine, nozzle angle 17°, mean blade speed 125 m/sec., exit angles of the first row moving blades, the fixed blades, and the second row moving blades are 22°. 26° and 30° respectively, blade friction factor for each row 0.9. Assume that the absolute velocity of steam leaving the stage is in the axial direction. Draw the velocity diagram for the stage and find (a) absolute velocity of steam leaving the stage ; (b) diagram work ; (c) diagram efficiency.

   (15 marks)

8. (a) Explain a fission chain with an example.   (7 marks)

   (b) Mention the functions of the following in nuclear reactor :—

     (i) Reflector ; (ii) Moderator ; (iii) Control rods ; (iv) Coolant.

   (8 marks)

Or

9. (a) What are the principal parts of nuclear reactor ? Explain each part in brief.   (7 marks)

   (b) A base load station having a capacity of 25 MW, a standby station having a capacity of 20 MW, share a common load. Find (i) annual load factor ; (ii) use factor ; (iii) capacity factor of the two power stations from the following data :—

   Annual standby station output = 7.35×10^6 k Wh.

   Annual base load station output = 101.35×10^6 kwh.

   Peak load on the stand by station = 12 MW

   Hours of use of standby station during the year = 2190 hours.

   (8 marks)

[4 × 15 = 60 marks]