EE 222 (R-20)

Total No. of Questions : 10] [Total No.of Pages : 03

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

Second Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEMS - I

Time : **Three Hours** Maximum : **70** Marks

Answer ONE question from each Unit. 5x14=70 M

All Questions carry equal marks.

UNIT - I

1. a) List and explain the different methods of feed water treatment in thermal power station.

   b) Explain the working boiling water reactor (BWR) with a neat sketch.

(OR)

2. a) Draw the block diagram of Thermal power station and state the classification of boilers used in Thermal power stations.

   b) Draw the schematic diagram of hydroelectric power station and discuss its operation and functions.

UNIT - II

3. a) What are the characteristics of daily load curve ? Define the terms the load factor and diversity factor and discuss their effect on the cost of generation of electrical energy.

   b) A three-phase double circuit has six conductors located at the corners of a regular hexagon of side 3m. Each conductor has a diameter of 31.77 mm. The line is completely transposed. Find (i) the inductive reactance per phase km of the line, and (ii) the capacitance reactance to neutral per km of the line. If one of the circuits is removed calculate the per unit changes in inductive and capacitive reactances.

(OR)

4. a) A generating station supplied the following loads : 175 MW, 100 MW, 80 MW, 50 MW and 4 MW. The station has a maximum demand of 225 MW. The annual load factor of the station is 45%. Calculate (i) the number of units supplied annually (ii) the diversity factor and (iii) the demand factor.

P.T.O.

b) An overhead single phase delivers 1.2 MW at 33 KV at 0.9 pf lagging the total resistance of the line is 12 Ω and the total inductive reactance is 18Ω. Calculate

(i) % voltage regulation.

(ii) Sending end power factor.

(iii) Transmission efficiency.

UNIT - III

5. a) A 275 KV overhead transmission line has following characteristics :

$Z = (12.5 + j\ 66)\Omega$, $Y = 4.4 \times 10^{-4} < 90^{o}S$. Calculate the ABCD constants and the surge impedance of the line.

b) A single phase overhead line is transmitting 1200KW power to a factory at 11KV and 0.75 power factor lagging. The total resistance and the loop reactance of the line are 3.1 ohm and 4.4 ohms respectively. Find the sending end voltage, Sending end power factor, percentage of regulation and the transmission efficiency.

(OR)

6. a) A three phase 50 Hz, 200 Km long transmission line has three conductors each of 0.7cm radius spaced at the corners of triangle of side 2m, 3.5m and 4.5m the resistance of each conductor is 0.4 ohms per km lagging p.f. of 0.85. Find ABCD constants as long line and regulation.

b) Explain the procedure to calculate regulation of four terminal short network using ABCD coefficients. Derive the necessary constants.

UNIT - IV

7. a) Prove that the velocity of propagation of travelling waves is equal to the velocity of light.

b) A 3-phase, 50 Hz, 144 kV transmission line has conductors in equilateral formation spaced 2.2m apart the conductor diameter is 1.02 cm and the surface factor is 0.86. The air pressure and temperature and 76 cm of Hg and 28^{o}C respectively. Determine the critical visual voltage for corona and the corona losses per km per phase of the line MV = 0.75.

(OR)

8. a) Explain how power losses due to corona can be calculated. And also explain about the following factors which effects corona loss (i) Electrical factors (ii) Atmospheric factors (iii) Factors connected with the conductors.

   b) Derive the reflection and refraction coefficients of a line terminated with a resistance.

UNIT - V

9. a) Explain the methods of grading of cables with neat diagram and equations.

   b) Derive the expression for the capacitance of a single-core cable.

(OR)

10. a) A single core 60 KV cable working on 3-phase system has a conductor diameter of 2 cm and a sheath of inside diameter 5.3 cm. If two inter sheaths are introduced in such a way that the stress varies between the same maximum and minimum in the three layer field. (i) Positions of inter sheaths (ii) Voltages on the their inter sheaths (iii) Maximum and minimum stresses.

    b) Derive the expression for the capacitance of a three core belted type cable.