Total No. of Questions : 10] [Total No. of Printed Pages : 4

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EX–505(O)

B. E. (Fifth Semester) EXAMINATION, Dec., 2009

(Old Scheme)

(Electrical & Electronics Engg. Branch)

POWER SYSTEM – I

[EX – 505(O)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *one* question from each Unit. Internal choice are there within each Unit.

Unit – I

1. (a) Draw the schematic diagram of a modern steam power station and explain its operation. 10

   (b) Discuss the merits of a hydroelectric plant. 10

Or

2. (a) Derive the expression for economic load dispatch, neglecting transmission losses. 10

   (b) The fuel inputs per hour of plants 1 and 2 are given as : 10

   $F_1 = 0{\cdot}2\,P_1^2 + 40\,P_1 + \text{Rs. } 120 \text{ per hr.}$

   $F_2 = 0{\cdot}25\,P_2^2 + 30\,P_2 + \text{Rs. } 150 \text{ per hr.}$

P. T. O.

Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 100 MW and 25 MW, the demand is 180 MW and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per equal incremental production cost. 10

Unit – II

3. (a) Prove that the inductance per unit length of an overhead line due to internal flux linkages is constant and is independent of size of conductor. 10

   (b) A three-phase, 50 Hz line consists of three conductors each of diameter 21 mm. The spacing between the conductors is as follows : 10

   A – B = 3 m, B – C = 5 m, C – A = 3·6 m

   Find the inductance and inductive reactance per phase per km of the line.

Or

4. Explain the following : 20

   (i) Grading of cables

   (ii) Dielectric stress in cables

   (iii) Classification of cables

Unit – III

5. (a) Explain nominal π (pi) model representation of medium transmission line with phasor diagram. 8

   (b) A three-phase, 50 Hz transmission line, 40 km long delivers 36 MW at 0·8 power factor lagging at 60 kV (phase). The line constants per conductor are R = 2·5 Ω, L = 0·1 H, C = 0·25 μ F. Shunt leakage

may be neglected. Determine the voltage, current, power factor and active power at sending end. Use nominal T method. 12

Or

6. (a) Draw and explain receiving end power circle diagram. 10

(b) Explain the different methods of voltage control in transmission lines. 10

Unit – IV

7. (a) Explain the different types of conductors used in over-head transmission lines. 10

(b) Calculate the sag for a span of 200 m if the ultimate tensile strength of conductor is 5758 kgf. The weight of conductor is 604 kgf/km. Allow a factor of safety of 2. 10

Or

8. (a) Explain different types of overhead line insulators giving their merits and area of application. 10

(b) A string of suspension insulator consists of four units. The voltage between line conductor and earth is 100 kV. The capacitance between each link pin and earth is one-tenth of the self capacitance of a unit. Find voltage distribution across each unit. 10

Unit – V

9. (a) Explain Kelvin's law for most economical size of conductor. State its limitations. 10

(b) Explain briefly the various systems of a. c. distribution. 10

Or

10. (a) Draw and explain the layout of a typical outdoor substation showing major equipments. 10

(b) Explain the different bus-bar arrangements in a substation in detail. 10