Roll No.

Total No. of Pages : 3

7E7045

B.Tech. VII Semester (Main and Back) Examination, Nov. - 2019

Electrical Engineering.

7EE5A Power System Engineering

(Common for EE,EX)

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any five questions, selecting one question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

1. Calculator - 100 Ms.

Unit - I

1. a) Derive the condition of economic distribution of load between large number of generating units without considering losses in transmission line. **(8)**

b) A simple power system consists of two plants connected by a transmission line. The load in the system is directly connected at the bus of plant 2. When 100 MW power flows from plant 1 to plant 2, then 15 MW is lost in transmission. The incremental costs of two plants are : -

$$\frac{dC_1}{dP_1} = 0.20P_1 + 20 \text{ Rs/Mwh}$$

$$\frac{dC_2}{dP_2} = 0.15P_2 + 30 \text{ Rs/Mwh}$$

Calculate the economic loading of plants 1 and 2 for system $\lambda = 60$. Also calculate the transmission loss and total demand. **(8)**

(OR)

1. a) Derive the function of transmission losses for a system having two generators. (8)

b) The incremental costs in Rs/mw-hr of two 250 mw units are as under :-

$$\frac{dC_1}{dP_1} = 0.20P_1 + 30$$

$$\frac{dC_2}{dP_2} = 0.15P_2 + 40$$

Find the economic loading for the total load of 225 mw. Also calculate the saving per year for economic loading compared to equal load division between the units throughout the year. (8)

Unit - II

2. a) Define the steady state limit of a transmission line. Derive an expression for steady state stability limit of a transmission line connected two machines. (8)

b) A 4 - pole, 50 Hz, 11 kv turbo alternator has a rating of 100 Mw at power factor of 0.85 lagging. The rotor has a moment of inertia of a 10,000 kg-m^2. Calculate the H and M of the machine. Also calculate the stored energy in the rotor at sychronous speed. (8)

(OR)

2. a) Derive the swing equation of synchronous machine. (8)

b) Find the expression for angular momentum (M) in terms of machine MVA rating (G), machine inertia Constant (H) and system frequency (f), Also find out the expression for per unit angular momentum M (pu). (8)

Unit - III

3. Explain the application of equal area criterion to study transient stability for a fault away from line ends. Also derive the expression for critical clearing angle and critical clearing time. (16)

(OR)

3. Given the system of fig. 1 where a three - phase fault is applied at the point P as shown. (16)

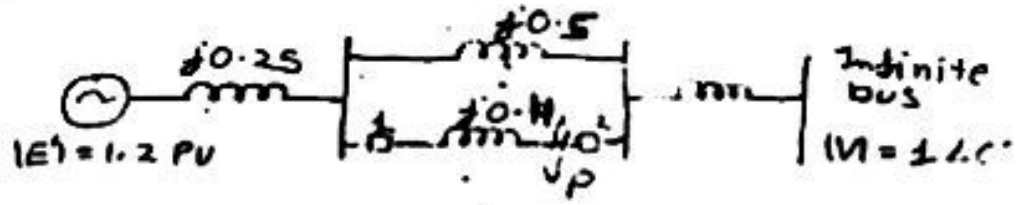

Fig. 1

Find the critical clearing angle for clearning the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated on the diagram. The generator is delivering 1.0 Pu power at the instant proceeding the fault.

Unit - IV

4. a) Draw and describe the separately excited A.C. excitation system. (8)

   b) Write the advantages of inter connected power system. Define cold reserve. (6+2)

(OR)

4. a) Explain the DC excitation system with fundamental block diagram and their brief description. (8)

   b) Define various types of reserve capacities used in power systems. (8)

Unit - V

5. a) Discuss the method of voltage control in power system using tap changing transformers. (8)

   b) Define normal operating state, emergency operating state and restorative operating state of power system. (8)

(OR)

5. a) Explain phase shifting transformer with its applications. (8)

   b) Write short note on :

      i) Shunt capacitor

      ii) Series capacitor. (8)