Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 08

M.Tech. (EE) (2018 & Onwards) (Sem.–1)

POWER SYSTEM DYNAMICS-I

Subject Code : MTEE-102-18

M.Code : 75216

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWELVE marks.**

1. A generator is delivering 25% of the maximum power, Pmax to an infinite bus through a transmission line. A fault occurs such that the reactance between the generator and the bus increases to a value two times its pre-fault value.

   a) Find the angle δ_o before the fault

   b) Show graphically what happens when the fault is sustained.

   c) Find the maximum value of the δ swing in case of a sustained fault.

2. 'Modern power systems are characterized by extensive system interconnections. The development of fast acting static exciters and electronic voltage regulators overcame, to a large extent, the transient stability and steady state stability problems'. What are the different types of excitation systems that are used for the control of voltage stability? Explain any one of them, in detail, with functional block diagrams.

3. Under steady state operating conditions, the armature of the salient pole synchronous generator carries symmetrical sinusoidal three-phase currents, where $\theta d = \omega t + \delta + 90°$. Using the Park's -transformations, find the expressions for the corresponding d-q-0 currents of the armature.

4. Calculate the per unit value of X'_d for the 60 Hz, 635MVA, 24 kV(Base voltage), synchronous machine, given that, Ls = 2.7656 mH; $L_{ab} = M_s$ = 1.3828 mH; M_f = 31.695 mH;

   L_{ff} = 433.657 mH. The symbols have their usual meanings.

5. 'Subtransient reactance, X''_d is important in calculating currents resulting from short-circuit faults at or near synchronous generators'. Using the simplified equivalent circuits, through Park's transformations, derive the expression and therefore define the subtransient reactance, X''_d.

6. Making use of the phasor diagrams, for a synchronous machine, graphically show the pre-fault and post-fault voltage and current phasors separately. All the quantities should be properly represented and explained through formulas, where required.

7. '*In most AC generators, excitation and steam flow control are expected to run concurrently for best results. By employing a load angle signal to the control of both the exciter and the prime mover, a very substantial improvement is effected both in the steady state and transient stability of a synchronous machine*'. Explain the above statement in detail with appropriate equations to support.

8. 'The Heffron-Phillips model of a synchronous machine has successfully been used for investigating the low frequency oscillations and for off-line design of power system stabilisers'. Describe in detail the Heffron-Phillips model.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.