M.E. First Semester (Electrical (Electronics & Power) Engg.) (New-CGS)

13317 : Modelling & Analysis of Electrical Machines : 1 EEPME 5

P. Pages : 2

Time : Three Hours

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AW - 3852

Max. Marks : 80

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.
5. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Obtain an expression for the electrical torque of the Kron's primitive machine. **7**

b) Explain in detail comparison between Three phase induction machines and synchronous machine. Also give the application of these machines. **7**

OR

2. a) With the help of suitable diagram describe the common essential features of rotating machines. **7**

b) Write the voltage equation for Kron's primitive machine in matrix form. What observation are made from the impedance matrix of this machine ? **7**

3. a) Explain in details application to DC machine for steady state and transient analysis. **6**

b) What is meant by the term "Linear Transformation" used in the Electrical machine ? Explain with suitable example. **7**

OR

4. Deduce parks transformation relating the 3 phase current of a synchronous machine to its corresponding d.g. axis current. Express three phase current its inverse. **13**

5. a) What are the common problems concerning the dynamics of induction motor. **7**

b) Draw the generalized mathematical model of a polyphase induction machine. Write down the voltage equation for this model. **6**

OR

6. a) Explain the term air gap power, internal mechanical power developed and shaft power how are these term related with each other. **7**

b) With the help of phasor diagrams explain the effect of armature reaction in Alternator. **6**

7. a) Explain how park transformation transform equation in a, b, c variables to d, q, o variables. **7**

b) Define the short circuit ratio of synchronous generator. Show that SCR is equal to reciprocal of per unit value of direct axis synchronous reactance X_d. **7**

OR

8. a) What are the various basic parameter of synchronous machine ? Derive expression for armature to field mutual inductance and armature self inductance for salient pole synchronous machine. 7

b) A three phase star connected 50 Hz synchronous generator has direct axis synchronous reactance of 0.65 p.u. and quadrature axis synchronous reactance of 0.5 p.u. The generator delivers a rated kVA at rated voltage, at a power factor 0.8 lagging calculate the open circuit voltage and voltage regulation resistance drop at full load is 0.02 p.u. 7

9. a) What are the causes of disturbance in synchronous machine. 7

b) Show that $T_d'' = T_{do}'' \cdot \frac{X_d''}{X_d'}$ 6

OR

10. a) Explain the term forced oscillation and its effect in synchronous machine. 7

b) Why the frequency of incoming machine should be slightly higher than of infinite bus at a time of synchronization ? What are the different conditions of synchronization ? 6

11. a) Explain the various reactance and time constant from d-axis equivalent circuit 3-phase synchronous machine. 7

b) Explain Taylor's expansion procedure to obtain the linearized machine equation. 6

OR

12. a) Explain the changes that should made in linearized equation of 3 phase induction machine. 7

b) Calculate the eigen values for the 3 HP I.M. for stator voltage of frequencies of ¼, ½ and ¾ noted. Assume the amplitude of the applied voltage decreases linearly with frequency. 6

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