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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M. TECH DEGREE EXAMINATION

Electrical & Electronics Engineering

04EE6201—Dynamics of Electrical Machines

Max. Marks : 60 Duration: 3 Hours

PART A

Answer All Questions

Each question carries 3 marks

1. Explain transformer voltage and speed voltage in electrical machines.
2. Derive the voltage equations of separately excited dc generator from its basic two pole machine representation
3. Obtain the expression for armature self inductance of synchronous machine
4. Describe any method of measurement of positive sequence reactance of three phase synchronous machine with appropriate experiment.
5. Derive the generalized voltage equations for three phase Induction machine.
6. Explain the effect of voltage and frequency variations on the induction motor performance
7. Explain revolving field theory of single phase induction motor
8. Derive the electromagnetic torque equations from the primitive machine model of a single phase induction motor by applying cross field theory

PART B

Each question carries 6 marks

9. Derive the generalized machine Voltage and Electrical Power equation from Kron's primitive machine model.

OR

10. Derive the a-b-c to α-β transformation matrix and prove that power invariance is maintained in the above transformation

11. A 230V, separately excited dc motor is driving a constant load torque, given:
    Ra=0.4 Ω, La=0.01H, Rf =115Ω Motor torque constant =2Nm/armature ampere, Friction and windage constant D=0. The armature current is 50A, with rated voltage across the armature and field. Determine the magnitude of constant load torque. If the armature voltage is suddenly reduced by 20V find the speed as a function of time. Total J=12kgm^2

OR

12. A separately excited DC generator gave a no load output voltage of 240V at a speed of ω_r and a field current of 3A. Find the generated emf per field ampere, $M_d\omega_r$ Also find the voltage V_2 as a function of time when a 240V is suddenntly applied to the field winding with the armature running at constant speed ω_r. R_f =60 Ω, L_f =60H, . R_a =0.02Ω and La =0.01H and R_L=0.38Ω
13. Derive the expression for Reactive Power of both salient pole and cylindrical Rotor synchronous Machine

OR

14. Explain the power angle characteristics of cylindrical rotor machines and salient pole machine.Derive the expression used.

15. Analyse the transient behavior of a synchronous generator after neglecting all the resistances. Draw the armature currents and field current after sudden three phase short circuit

OR

16. Explain transient power angle characteristics of a 3 phase synchronous machine and compare it with the steady state power angle characteristics with appropriate diagrams and equations
17. Apply generalized machine theory to 3 phase Induction machine and obtain the expression for Torque developed.

OR

18. Explain the steady state operation of a 3 phase Induction machine and find its equivalent circuit
19. The following data pertains to a 230V, 50Hz capacitor start single phase induction motor at standstill.Main winding excited alone: 100V, 2A, 40W.

    Auxillary winding excited alone:80V, 1A, 50W

    Determine the value of capacitance for obtaining the maximum torque

OR

20. A 230V, 4 pole, 50Hz single phase induction motor has the following constants and losses R_1 =2.3Ω, X_1=3.2Ω, R_2 =4.2Ω, X_2=3.2Ω, X_m =74Ω, core loss= 98W, friction and windage loss=30W. If this motor is running with a slip of 0.05 at rated voltage and frequency then compute the the stator current , pf power output, torque and efficiency with its auxiliary winding open.