PVP 20

Code: 20EE3402

II B.Tech - II Semester – Regular Examinations – JULY 2022

ELECTRICAL MACHINES - II
(ELECTRICAL & ELECTRONICS ENGINEERING)

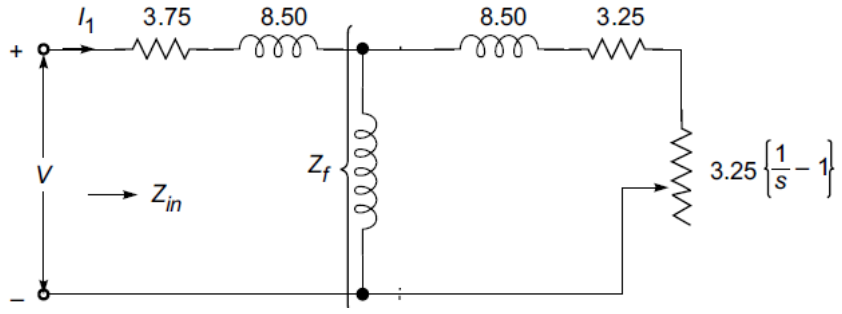
Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) From the equivalent circuit of induction motor derive the slip at maximum torque. 6 M

   b) A 400V, 50 Hz induction motor's equivalent circuit is given in the below figure. Find no load current (i.e, at s=0), short circuit current (i.e, at s=1) and draw current locus diagram with the variation in slip. (take Z_f=160)



8 M

OR

2. a) Develop an expression for full load torque of 3 ϕ induction motor. 7 M

   b) Draw the equivalent circuit diagram and phasor diagram of 3 ϕ induction motor. 7 M

UNIT – II

3. a) A 3 phase 415V induction motor gave the following test readings

No load: 450 V 10 A 1250W

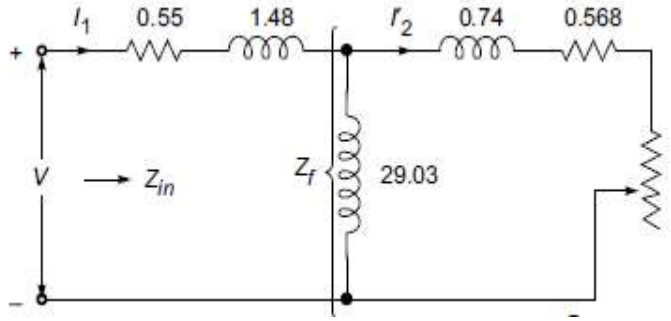
Blocked rotor: 150 V 40 A 4000W

Draw the circle diagram if the normal rating is 15 kW and determine the full load values of current, power factor and slip at which maximum torque occurs using the circle diagram. 8 M

b) Discuss in detail how the rotor resistance starter limits the starting currents of induction motor using necessary circuits. 6 M

OR

4. a) A 400V, 50 Hz, 6-pole star connected induction motors per phase equivalent is given in below figure. Find all the loss components if the induction motor operates at slip 0.04 and rotation losses equal to 600W?



7 M

b) Develop the relation of line currents and starting torque between DOL starter and Star-Delta starter using necessary circuits. 7 M

UNIT-III

5. a) A 150MW, 13kV, 0.85pf synchronous generator has the following open circuit and short circuit characteristic 7 M

test data; find the voltage regulation using MMF method if the machine supplies full load at 0.85 pf lagging and a terminal voltage of 13kV. **SC Data-** I_{sc}=8000A at I_f=750A

Open circuit test data-

I_f(A)	200	450	600	850	1200
V_{oc} (L-L) in kV	4	8.7	10.8	13.3	15.4

b) Why parallel operation of alternator is necessary? What are the advantages of connecting alternator in parallel? Mention all necessary conditions for successful parallel operations of alternators. 7 M

OR

6. a) Derive an emf expression of an alternator from fundamentals showing clearly the expressions for pitch and distribution factors. Also derive the ratio of induced emfs of n^{th} harmonic to fundamental. 7 M

b) Derive an expression for synchronizing torque when a 3-phase alternator is connected to infinite bus-bar. 7 M

UNIT – IV

7. a) What are the differences between synchronous motor and induction motor and explain the operation of synchronous motor with variable excitation at constant load? 7 M

b) Explain the significance of V curves and inverted V-curves. 7 M

OR

8. a) Explain the various starting methods of synchronous. motor. 7 M

b) With the help of phasor diagram explain the effect of change in excitation on armature current and power factor of synchronous motor. 7 M

UNIT – V

9. a) Using double revolving field theory explain the torque–slip characteristics of a single-phase induction motor and prove that it cannot produce starting torque? 7 M

b) Detail the working of reluctance motor and compare the torque profile with induction motor. 7 M

OR

10. a) Discuss the procedure for determining the parameters of equivalent circuit of a single-phase induction motor. 7 M

b) Draw the cross-sectional diagrams of stepper and BLDC motors. 7 M