Government Polytechnic Sheohar

Department of Electrical Engineering

Unit wise Previous Years and Guess Questions

Subject: AC Machines (2420403)
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UNIT–01 (3-Phase Induction Motor)

Q.1 Explain with the help of suitable diagram how rotating magnetic field is produced in a three phase induction motor.

Q.2 Explain the construction and working principle of a 3-phase induction motor. Why does an induction motor never run at synchronous speed?

Q.3 Draw and explain torque–slip characteristics of polyphase induction motor under running condition.

Q.4 What is meant by slip in a synchronous motor? Why does the slip of an induction motor increase as the torque is increased?

Q.5 Derive the expression for developed torque in a 3-phase induction motor and find the condition for maximum torque.

Q.6 Derive the torque equation of a 3-phase induction motor under running condition.

Q.7 Compare slip ring induction motor with squirrel cage induction motor on any four parameters.

Q.8 Derive the condition for maximum torque under running condition of a 3-phase induction motor.

Q.9 State the reason of skewed rotor bars in a three phase squirrel cage induction motor.

Q.10 Define synchronous speed. Deduce the relationship between synchronous speed and rotor speed.

Q.11 Draw and explain block diagram showing power stage of 3-phase induction motor.

Q.12 Discuss why induction motor is called a generalized transformer.

Q.13 Explain maintenance procedure of 3-phase induction motor.

Q.14 Draw and explain torque–slip characteristics of 3-phase induction motor.

Q.15 Explain working of auto-transformer starter for a 3-phase induction motor with neat diagram.

Q.16 Compare between squirrel cage type and wound rotor type 3-phase induction motor.

Q.17 Explain why the rotor of three phase squirrel cage induction motor rotates in the same direction as the rotating magnetic field.

Q.18 Explain the necessity of starters in 3-phase induction motor.

Q.19 Discuss any two speed control methods employed in 3-phase induction motor.

Q.20 The power input to a 500 V, 50 Hz, 6-pole, 3-phase induction motor running at 97 kW. The stator losses are 1 kW and friction and windage losses are 2 kW.
Calculate:
a) Slip
b) Rotor copper loss
c) Shaft power

Q.21 The power input to the rotor of 440 V, 50 Hz, 6-pole, three phase induction motor is 80 kW. The motor e.m.f. is observed to make 100 complete alternations per minute.
Calculate:
a) Slip
b) Rotor speed
c) Mechanical power
d) Rotor copper loss

Q.22 The power input to the rotor of a 400 V, 50 Hz, 6-pole, 3-phase induction motor is 75 kW. The rotor electromagnetic force is observed to make 100 complete alternations per minute.
Calculate:
a) Slip
b) Rotor speed
c) Rotor copper loss per phase

UNIT–02 (1-Phase Induction Motor)

Q.1 Explain with neat diagram the following types of single phase induction motor:
i) Split phase induction motor
ii) Capacitor start induction run motor

Q.2 Explain why the air gap between stator core and rotor of an induction motor is made very small.

Q.3 Explain the two-field revolving theory for single phase motor.

Q.4 Explain the construction and principle of working of universal motor and mention its applications.

Q.5 Describe the construction features and operating characteristics of a shaded pole motor. Explain the speed control of 1-phase induction motor.

Q.6 Write the construction and working of shaded pole induction motor with neat diagram.

Q.7 Explain with necessary diagram the working of capacitor start, capacitor run induction motor.

Q.8 Explain with neat sketches working of hysteresis motor.

Q.9 Explain why single phase induction motor is not self-starting with the help of double field revolving theory.

Q.10 State the double field revolving theory of 1-phase induction motor.

Q.11 Explain working of capacitor start-run single phase induction motor with suitable phasor diagram.

Q.12 Why 1-phase induction motor doesn't have self-starting torque? Explain with the help of double field revolving theory.

Q.13 Explain working of shaded pole induction motor with suitable diagram.

Q.14 Draw the connection diagram of capacitor start motor with its important windings and explain its working.

Q.15 The frequency of the e.m.f. in the stator of a 4-pole induction motor is 50 Hz and that in the rotor is 50 Hz. What is the slip and at what speed is the motor running?

Q.16 Define:
i) Universal motor
ii) Hysteresis motor

Q.17 Write a short note on maintenance of 1-phase induction motor.

Q.18 Why single phase induction motor has low power factor?

Q.19 State any four uses of single phase induction motor.

Q.20 What are the methods available for making single phase induction motor self-starting?

Q.21 Compare the AC series motor with universal motor and mention their operational difficulties.

Q.22 Explain capacitor start capacitor run motors of a single phase induction motor.

Q.23 What are the various methods available for making a single phase motor self-starting?

UNIT–03 (3-Phase Alternators)

Q.1 What is meant by full pitched and short pitch winding? What is meant by pitch factor?

Q.2 Explain how the armature reaction influences the field distribution of an alternator for varying power factor.

Q.3 Why alternators are required to be operated in parallel?

Q.4 Explain how the induced e.m.f. in armature winding in an alternator is affected by:
i) Form factor
ii) Pitch factor

Q.5 Discuss the load characteristics of alternator for different load power factor.

Q.6 State any four advantages of having stationary armature in case of 3-phase alternator.

Q.7 Compare salient rotor and cylindrical rotor for alternator.

Q.8 Explain the effect of armature reaction at various power factor of load on alternator. Draw suitable waveform showing the effect.

Q.9 Define the voltage regulation of an alternator. Explain synchronous impedance method for finding regulation of alternator.

Q.10 Derive EMF equation of alternator. State the meaning of each term used in it.

Q.11 State the advantages of rotating field in 3-phase alternator.

Q.12 Explain the factors affecting the terminal voltage of alternator.

Q.13 Derive the e.m.f. equation of a 3-phase alternator.

Q.14 What is armature reaction? With suitable diagram discuss the effect of lagging power factor on armature reaction of alternator.

Q.15 Define voltage regulation for the alternator. How the voltage regulation for the alternator is determined using synchronous impedance method?

Q.16 Write down the equation for frequency of e.m.f. induced in an alternator.

Q.17 Why do cylindrical rotor alternators operate with steam turbines?

Q.18 Why short pitch winding is preferred over full pitch winding?

Q.19 Write down the formula for distribution factor.

Q.20 Why are alternators rated in kVA and not in kW?

Q.21 Define the term voltage regulation of alternator.

Q.22 What is meant by load angle of an alternator?

Q.23 What is synchronous impedance?

Q.24 What is meant by armature reaction in alternators?

Q.25 Why is the synchronous impedance method of estimating voltage regulation considered as pessimistic method?

UNIT–04 (Synchronous Motor)

Q.1 Why are synchronous motors not self-starting? How is the synchronous motor made self-starting?

Q.2 Explain why a synchronous motor will operate at constant speed on every load.

Q.3 Explain with neat sketch the principle of operation of a 3-phase synchronous motor. Also explain why it will not run at other than synchronous speed.

Q.4 Draw a phasor diagram of a synchronous motor. Explain the effect of:
i) Change in excitation if load is constant
ii) Change in load if excitation is constant

Q.5 Draw and explain V and inverted-V curves of synchronous motor.

Q.6 Explain in brief why synchronous motor is not self-starting.

Q.7 Explain hunting and phase swinging in synchronous motor.

Q.8 List different starting methods of 3-phase synchronous motor.

Q.9 Define:
i) Pull-in torque
ii) Pull-out torque

Q.10 Explain with suitable diagram the phenomenon of hunting. State the causes and effect of hunting in 3-phase synchronous motor.

Q.11 Explain the effect of variable excitation on the behavior of synchronous motor under constant load condition.

Q.12 Explain the principle of operation of 3-phase synchronous motor. State the significance of load angle.

Q.13 What do you mean by hunting in synchronous motor?

Q.14 Describe the different methods of cooling the synchronous motor.

Q.15 Write short notes on:
i) Losses in synchronous motor
ii) Method of starting of synchronous motor

Q.16 What is meant by hunting in a synchronous motor? Why is it undesirable? What is done to minimize it?

Q.17 Explain what happens when the load on a synchronous motor is changed.

Q.18 Mention some specific applications of synchronous motor.

Q.19 A 3 kV delta connected synchronous motor has synchronous reactance of 15 Ω per phase. It operates at a leading power factor of 0.8 when drawing 700 kW from mains. Find excitation EMF.

Q.20
a) Derive the expression for mathematical analysis of power developed by synchronous motor.
b) Explain the hunting of a synchronous machine.

UNIT–05 (Special Electrical Machines)

Q.1 Describe the working of switched reluctance motor with suitable diagram.

Q.2 State any four applications of BLDC motor.

Q.3 Explain construction and working of AC servo motor.

Q.4 Draw and explain dynamic characteristics of stepper motor.

Q.5 Explain construction and working of synchronous reluctance motor.

Q.6 Draw and explain speed–torque characteristics of DC and AC servo motor.

Q.7 Explain the construction and working of stepper motor.

Q.8 Define:
i) Stepper motor
ii) BLDC motor
iii) Permanent magnet synchronous motor
iv) AC servo motor
v) DC servo motor

Q.9 List four applications of reluctance motors.

Q.10 Give two advantages and two applications of stepper motor.

Q.11 List four applications of permanent magnet synchronous motor.