KINGS

COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL MACHINES-II
QUESTION BANK

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YEAR/SEM : II / IV **BRANCH : EEE**

UNIT-I

PART –A(TWO MARKS)

1. What is an alternator? (2)
2. What is the equation for induced emf in an alternator? (2)
3. What are the advantages of having rotating field system? (2)
4. Define voltage regulation of an alternator. (2)
5. Why is EMF method called pessimistic method? (2)
6. Does changing the number of conductors have any effect on the frequency? (2)
7. Why is MMF method called optimistic method? (2)
8. Compare salient pole rotor and smooth cylindrical rotor. (2)
9. How is the armature winding in alternators different from those used in machines? (2)
10. What are squirrel cage windings of alternators? How and why they are used? (2)
11. Represent the power/power angle curve of a synchronous generator. (2)
12. What is the principle of an alternator? (2)
13. What is the relation between speed and frequency of an alternator? (2)
14. What do you meant by hunting in alternators? (2)
15. What do you meant by synchronizing power? (2)
16. What are the methods used to determine losses in alternator? (2)
17. What are the conditions for parallel operation of alternators? (2)
18. What are the methods used for synchronization? (2)
19. Define short circuit ratio of an alternator. (2)
20. Define pitch factor. (2)
21. Define distribution factor. (2)
22. Draw the phasor diagram for a lagging power factor load alternator. (2)
23. What do you meant by synchronous reactance? (2)
24. What do you meant by capability curves? (2)
25. Why alternator is called Synchronous generator? (2)

PART –B

1. Find the no load phase and line voltages of a star connected 3 phase, 6 pole alternator which runs at 1200 rpm, having flux per pole of 0.1wb sinusoidally distributed. It's stator has 54 slots having double layer winding. Each coil has 8 turns and the coil is chorded by 1 slot. **(16)**

2. The open circuit and short circuit readings for a 3 phase, star connected 1000kVA, 2000V, 50Hz, synchronous generator are:

Field amperes	10	20	25	30	40	50
OC terminal voltage(V)	800	1500	1760	2000	2350	2600
SC armature current(A)	-	200	250	300	-	-

The armature effective temperature is 0.2Ω per phase. Draw the characteristics curves and estimate the full-load percentage regulation at 0.8pf lagging and 0.8pf leading. **(16)**

3. A 3300V, 3phase star connected alternator has a full load current of 100A. On short circuit a field current of 5A was necessary to produce full load current. The emf on open circuit for the same excitation was 900V. The armature resistance was 0.8 Ω/phase. Determine the full load voltage regulation for (1)0.8pf lagging (2)0.8pf leading. **(16)**

4. A 3 phase, 50Hz star connected 2000kA for a certain field excitation. With the same excitation, the open circuit voltage was 900V. The resistance between a pair of terminals was 0.12 Ω. Find the full load regulation at UPF and 0.8pf lagging. Draw the phasor diagrams. **(16)**

5. A 3 phase 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole 0.04wb and is sinusoidally distributed. The speed is 375 rpm. Find the frequency, phase emf and line emf. The coil span is 160^{o} electrical. **(16)**

6. a)Describe the principle and construction of slow speed operation generator with neat diagram **(8)**

6. b)Derive the emf equation of alternator **(8)**

7. What are the methods of determining regulation of alternator? Discuss each briefly **(16)**

8. Explain the procedure for POTIER method to calculate voltage regulation of alternator **(16)**

9. For a salient pole synchronous machine, prove the d-axis synchronous reactance X_d, can be obtained from its OCC and SCC. Neglect armature resistance. **(16)**

10.Explain the condition for parallel operation of 3 phase alternator with neat diagram **(16)**

UNIT-II

PART –A(TWO MARKS)

1. What is hunting? How is it minimized? (2)
2. When is a synchronous motor said to receive 100% excitation? (2)
3. What is synchronous condenser? (2)
4. When is a synchronous motor said to be under excited? What will be the pf at this condition? (2)
5. What are the inherent disadvantages of synchronous motor? (2)
6. Mention four applications of synchronous motor. (2)
7. What is the role of synchronous motor in a transmission line? How? (2)
8. Define pull out torque in synchronous motor. (2)
9. What are the different torqueses of a synchronous motor? (2)
10. What is meant by V curves of synchronous motor? (2)
11. Name the important characteristics of a synchronous motor not found in induction motor. (2)
12. What are the uses of damper winding s in synchronous motor? (2)
13. What are the special features of cylindrical rotor type synchronous motor? (2)
14. Why is a synchronous motor not self staring? (2)
15. When does a synchronous motor get over excited? (2)
16. Draw the “V” curve and Inverted “V” curve of synchronous motor. (2)
17. Give the expression for the gross mechanical power developed by synchronous motor. (2)
18. In what operating condition is a synchronous motor referred to as asynchronous condenser? (2)
19. What are the advantages of synchronous motor over other type of motors? (2)
20. What are the effects of load variation in synchronous motor?. (2)
21. Does change in excitation affect power factor of the synchronous motor? (2)
22. What do you meant by “V” curves of synchronous motor? (2)
23. What are the main parts of a synchronous motor? (2)
24. What are the two classifications of synchronous machines? (2)
25. What is a synchronous capacitor? (2)

PART-B

1. a) Explain the methods of starting synchronous motor against high-torque loads**.** **(8)**

1.b) Explain various torques associated with synchronous motor**.** **(8)**

2.a)Draw the equivalent circuit and phasor diagram of a synchronous motor.**(8)**

2.b)Explain the significance of V and inverted V curves. **(8)**

3a). Explain the working of synchronous motor with different excitations **(8)**

3.b)List out the main characteristic features of synchronous motor. **(8)**

4. Discuss the following

(a) Constant excitation circle **(8)**

(b) Constant power circle **(8)**

5. Derive the mechanical power developed per phase of a synchronous motor **(16)**

6.A 3300V,3 phase synchronous motor running at 1500 rpm has its excitation kept constant corresponding to no-load terminal voltage of 3000V. Determine the power

input, power factor and torque developed for an armature current of 250A if the synchronous reactance is 5 Ω per phase and armature resistance is neglected**.(16)**

7.A synchronous motor having 40% reactance and negligible resistance is to be operated at rated voltage at UPF,0.8pf lag,0.6pf lag, 0.8pf lead and 0.6pf lead. What are the values of induced emf. **(16)**

8.A 75 kW,400V,4 pole ,3 phase, star connected synchronous motor has a resistance and synchronous reactance per phase of 0.04Ω and 0.4 Ω respectively. Compute for full load 0.8pf lead the open circuit emf per phase and gross mechanical power developed. Assume an efficiency of 92.5%. **(16)**

9.A 6600V,3 phase, star connected synchronous motor draws a full load current of 80A at 0.8pf leading. The armature resistance is 2.2 Ω and reactance of 22 Ω per phase. If the stray losses of the machine are 3200w. Find (i) Emf induced (ii)Output power (iii) Efficiency of the machine. **(16)**

10.A 2000V,3 phase, 4 pole, star connected synchronous motor runs at 1500rpm. The excitation is constant and corresponding to an open circuit voltage of 2000V. The resistance is negligible in comparison with synchronous reactance of 3.5 Ω/ph. For an armature current of 200A.Determine (i) power factor (ii) power input (iii) torque developed. **(16)**

UNIT III

PART-A(TWO MARKS)

1. Name the important parts of induction motor. (2)
2. Name the two types of rotor of an induction motor. (2)
3. Name the classification of induction based upon the supply. (2)
4. What are the advantageous of three phase induction motor? (2)
5. What is Principle of operation of induction motor? (2)
6. State Faradays second law. (2)
7. Draw the phasor diagram of induction motor. (2)
8. A 50 Hz 3 phase 440 v, induction has speed of 1440 rpm on full load. A machine has 4 poles calculate the slip and how many complete alternations will the rotor voltage make per minute. (2)
9. What is meant by magnetic induction? (2)
10. Draw the power flow diagram of an induction motor. (2)
11. Draw the torque slip characteristics curve of an induction motor. (2)
12. Define the efficiency of an induction motor. (2)
13. Name the two types of rotor of an induction motor based on torque. (2)
14. Define self induced emf and magnetic induction. (2)
15. Give the expression for torque equation of three phase induction motor(2)
16. What is cogging? (2)
17. What is an induction generator? (2)
18. Define synchronous wattage. (2)
19. Explain why the pf of an induction motor is very low at starting. (2)
20. Why the air gap is kept minimum in induction motor? (2)
21. Why is it impossible for an induction motor to operate at synchronous speed? (2)
22. What information are learned in locked rotor test. (2)

23. What factors determine the direction of rotation of three phase induction motor? (2)
24. What is the difference in starting torque and when started by DOL starter and star delta starter? (2)
25. How will change the direction of rotation three phase induction motor? (2)

PART B

1. Explain the construction and working of three phase induction motor. **(16)**
2. Explain the power flow diagram and torque slip characteristics of induction motor. **(16)**
3. Derive the torque equation of a three phase induction motor **(16)**
4. Develope an equivalent circuit for three phase induction motor. State the difference between exact and approximate equivalent circuit. **(16)**
5. The power input to the rotor of a 3 phase, 50 HZ, 6 pole induction motor is 80 KW .The rotor emf makes 100 complete alternations per minute. **(16)**
Find
1) Slip
2) Motor Speed
3) Mechanical power developed
4) Rotor copper loss per phase
5) Rotor resistance per phase if rotor current is 65 A
6) Torque developed
6. Derive the equation for torque developed by an induction motor .Draw a typical torque – slip curve and deduce the condition for maximum torque. **(16)**
7. (i) A 3300V,10 pole ,50HZ three phase star connected induction motor has slip ring rotor resistance per phase =0.015 ohm and standstill reactance per phase =0.25 ohm .If the motor runs at 2.5 percent slip on full load ,find. **(16)**
1) Speed of the motor
2) Speed at which the torque will be maximum
3) The ratio of maximum torque to full load torque.
(ii) A 3 phase, 4 pole, 50 HZ induction motor is running at 1440 rpm. Determine the slip speed and slip.
8. A 3ph, 400 V IM, gave the test readings:
No load test: 400 V, 1250W, 9A
SC test: 150V, 4KW, 38A
Draw the circle diagram
If the normal rating is 14.91 KW, find from the circle diagram, the full load current and slip. **(16)**

UNIT- IV

PART-A(TWO MARKS)

1. State two advantage of speed control of IM by injecting an emf in the rotor circuit. (2)
2. Point out the disadvantages of rotor rheostat control to obtain variable speed of induction motor. (2)

3. Give the functions performed by induction motor starter. (2)
4. List out four methods of speed control in 3 phase induction motor. (2)
5. Why is starter necessary to start a 3 phase induction motor? (2)
6. What are the advantages and disadvantages of auto transformer starter? (2)
7. What is meant by stator voltage control? (2)
8. What are the different methods of stator voltage control? (2)
9. Draw the speed torque characteristics of stator voltage control. (2)
10. What is voltage /frequency method? (2)
11. What is the purpose of adding external resistance in the rotor circuit? (2)
12. Draw the speed torque characteristics of rotor resistance control. (2)
13. What are the advantages and disadvantages of rotor resistance control? (2)
14. What is meant by slip power recovery scheme? (2)
15. Why is speed control by pole changing technique suitable only to squirrel cage induction motors? (2)
16. Indicate the methods of starting 3 phase squirrel cage induction motor. (2)
17. What are the various methods of speed control of 3 phase induction motor from stator side? (2)
18. What are the speed controls of 3 phase induction motor from rotor side? (2)
19. What are the types of slip power recovery scheme? (2)
20. What are the disadvantages of cascade control? (2)

PART B

1. With neat diagrams explains the working of any two types of starters used for squirrel cage type 3 phase induction motor**.** **(16)**
2. Discuss the various starting methods of induction motors. **(16)**
3. Explain the different speed control methods of phase wound induction motor **(16)**.
4. Explain the various schemes of starting squirrel cage induction motor. **(16)**
5. Explain the speed control of 3 phase squirrel cage induction motor by pole changing. **(16)**
6. Discuss the theory of star – delta starter. **(16)**
7. Explain briefly the various speed control schemes of induction motors. **(16)**
8. Explain in detail the slip power recovery scheme. **(16)**
9. Explain the various techniques of sped control of induction motor from rotor side control. **(16)**
10. Explain the cascade operation of induction motors to obtain variable speed. **(16)**

UNIT -V

PART-A(TWO MARKS)

1. What are the different types of single phase induction motors? (2)
2. What are the applications of, characteristics of split phase motors? (2)
3. What are the applications of capacitor start motor? (2)
4. What are the main advantages of capacitor run motor? (2)
5. What are the applications and characteristics of capacitor run motor? (2)

6. Compare the performance and applications of resistance split phase and permanent capacitor single phase induction motors. (2)
7. Name any two applications of shaded pole induction motors. (2)
What are the drawbacks of the presence of the backward rotating field in a single phase induction motor? (2)
8. Is single phase induction motor self starting? Why? (2)
9. List out four applications of shaded pole induction motor. (2)
10. Draw the vector diagram for (a) Capacitor start (b) Split phase induction motor. (2)
11. What is the use of shading coil in the shaded pole motor? (2)
12. Why is capacitor –start induction motors advantageous? (2)
13. List out two disadvantages of shaded pole single phase motor and give two applications of the motor. (2)
14. What are the classifications of single phase induction motor based on the method of starting? (2)
15. Name the motors used in ceiling fan and in lathes. (2)
16. Draw the circuit diagram of any one type of 1- phase induction motor. (2)
17. Which type of single phase induction motor is to be selected for driving fans and blowers and why? (2)
18. Draw the circuit diagram of capacitor start 1 phase induction motor? (2)
19. How would you reverse the direction of rotation of a capacitor start induction run motor? (2)
20. What is stepper motor? (2)
21. List out four applications of reluctance motors. (2)
22. What are the demerits of repulsion motor? (2)
23. What type of motor is used in computer drivers? (2)
24. Determine the step angle of a single stack, 4 phase, 6 pole VR stepper motor. (2)
25. Mention some applications of reluctance motor. (2)

PART B

1. Give the classification of single phase motors .Explain the types pf single phase induction motors**.** **(16)**
2. Explain the double field revolving theory for operation of single phase induction motor. **(16)**
3. What are the types of single phase induction motor? Explain any two in detail. **(16)**
4. Explain the shaded pole induction motor with diagram. **(16)**
5. Develop equivalent circuit of a single phase induction motor ignoring core losses. **(16)**
6. Explain the working principle of single phase induction motor .Mention its four applications. **(16)**
7. What is the principle and working of hysteresis motor? Explain briefly. **(16)**
8. Explain the construction and working of stepper motor. **(16)**
9. Explain the principle of operation and applications of reluctance motor. **(16)**
10. Explain the principle of operation and applications of reluctance motor and hysteresis motor. **(16)**