DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

QUESTION BANK (2018-19)

NAME OF SUBJECT : ELECTRICAL MACHINES-II

REGULATION : R-16

COURSE : B-TECH

BRANCH : EEE

YEAR / SEMESTER : II/ II

UNIT-1

1 a)Write the merits and demerits of slip-ring induction motor.
b) What is the necessity of short-circuited rotor conductors in squirrel cage induction motor
c) Why the air gap between stator core and rotor of an induction motor is made very small.

2 a) Compare cage and wound 3-phase induction motor
b)What are the various losses in an induction motor?
c)What is slip? A 3-phase, 4-pole, 50Hz induction motor is running at 1440 rpm. Determine the slip.

3a) Describe with neat sketch the construction and principle of operation of a 3-phase cage type induction motor?
3b) Compare between squirrel cage and wound rotor induction motors. Also list their applications

4) Explain the principle of production of rotating magnetic field in a 3-phase induction motor.

5) A 6-pole, 50 Hz, 3-phase induction motor running on full-load develops a useful torque of 160 Nm and the rotor emf is observed to make 120 cycles/min. Calculate the net mechanical power developed. If the torque loss in windage and friction is12 N-m, find the copper-loss in the rotor windings, the input to the motor and efficiency. Assume stator losses as 800W.

6) The power input to rotor of a 400 V, 50 Hz, 6-pole, three-phase induction motor is 90 kW. The rotor e.m.f is observed to make 150 cycles per minute. Calculate (i) slip, (ii) rotor speed, (iii) mechanical power developed (iv) speed of rotor field with respect to rotor (v) speed of stator field with respect to rotor.

Unit-II

1a) Write the effects of crawling and cogging on the performance of induction motor.
1b) What is the principle of induction generator?
1c) Rotor resistance starting is preferred to reduced voltage starting of a wound rotor induction motor. Why?

2a) Write is the principle of double cage induction motor
2b) What is the procedure to conduct the no-load test in 3 –phase induction motor?
2c)Why the slots on the rotor of an induction motor are usually skewed.

3a) Why starting methods are needed for 3- phase induction motor?
b) A 3-phase slip-ring, induction motor with star-connected rotor has an induced e.m.f. of 120V between slip-rings at standstill with normal voltage applied to the stator. The rotor winding has a resistance per phase of 0.3 _ and standstill leakage reactance per phase of 1.2 _. Calculate (i) Rotor current/phase when running short-circuited with 4% slip and (ii) the slip and rotor current per phase when the rotor is developing maximum toque?

4) A 50 kW, 6-pole, 50 Hz, 450 V, 3-phase slip ring induction motor furnished following test figures:
No load test: 450 V, 20 A, p.f = 0.15
Blocked rotor test : 200 V, 150 A, p.f=0.3
The ratio of stator to rotor copper losses on short circuit was 5:4. Draw the circle diagram and determine (i) The full load current and power factor (ii) The maximum torque and the maximum power input (iii) Slip at full load (iv) Efficiency at full load.

5. a) Derive an expression for developed torque in a 3-phase induction motor and find the condition for maximum torque.
b) For a 3-phase induction motor, the rotor ohmic loss at maximum torque is 16 times that at full load torque. The slip at full load torque is 0.03. If stator resistance and rotational losses are neglected, then calculate the starting torque in terms of full load torque

UNIT-III

1. a) Write the advantages of AC series motor. [3M]
b) Explain the working principle of a single phase induction motor. [7M]

2. a). Why single phase induction motor does not develop a starting torque? [5M]
b) Explain the need for a winding in a split phase induction motor. [5M]

3.a) Explain in detail about double field revolving theory. [5+5]M
b) Explain the working of a capacitor start single-phase induction motor.

4. Derive equation for forward slip and backward slip of a single phase induction motor.[5+5]M

5.a) Explain the constructional features of a single phase induction machine. [4M]
b) What are the drawbacks of A.C. Series motor? Explain. [4M]

6.a) Can AC series motor be started on no-load? Explain. [3M]
b) What are different types of single phase motors and what are their applications? [3M]
c) What are applications of AC series motors?[4M]

UNIT-IV

1.a) Define Pitch factor of a synchronous machine. [6M]
a) Describe various types of A.C. generators indicating their applications. [4M]

2.a) Explain the principle of operation of a synchronous machine. [5M]
b) A 16 pole alternator has 144 slots. If the coil pitch is kept 5 slots, then calculate its pitch factor.[5M]

3. (a) Derive the e.m.f equation of an alternator and explain how the induced e.m.f in the armature winding is affected by (i) pitch factor and (iii) distribution factor.[6M]
b) What factors affect the size of alternator? [4M]

4.a) What is distribution factor? [3M]
b) Discuss the effect of armature reaction in an alternator. [8M]

5.a) Determine the frequency of a 8 pole alternator rotating at 375 R.P.M. If the no. of poles is doubled, then what will be its new frequency? [7M]
b) What is armature reaction? [3M]

6.a) Explain the load characteristics of an alternator. [5M]
b) Determine the frequency of a 12 pole alternator rotating at 600 R.P.M. If the no. of poles is tripled, then what will be its new frequency?[5M]

7. a) Define voltage regulation. [3M]
b) A 550V, 55kVA, 1-Phase alternator has an effective resistance of 0.2Ω. A field current of 10 A produces an armature current of 200 A on short-circuit and an electromotive force of 450 V on open circuit. Calculate the full load regulation with 0.8 power factor lagging.[7M]

8. a). Explain the ampere-turn method for the determination of voltage regulation of an alternator [5M]
b) Explain two reaction analysis of salient pole machines with phasor diagram. [5M]

9.a) What is potier reactance? [3M]
b. The following data were obtained for the OCC of a 10 MVA, 13 kV, 3-phase, 50 Hz, (7M) star-connected synchronous generator:

I_f (A)	50	75	100	125	150	162.5	200	250	300
V_{oc} (line) (kV)	6.2	8.7	10.5	11.6	12.8	13.7	14.2	15.2	15.9

An excitation of 100 A causes the full-load current to flow during the short-circuit test. The excitation required to give the rated current at zero p.f. and rated voltage is 290V.
(i) Calculate the adjusted synchronous reactance of the machine
(ii) Calculate the leakage reactance of the machine assuming the resistance to be negligible
(iii) Determine the excitation required when the machine supplies full-load at 0.8 p.f. lagging by using the leakage reactance and drawing the mmf phasor diagram. What is the voltage regulation of the machine?

10.a) Explain two reaction analysis of salient pole machines with phasor diagram. [5+5M]
b) Determine the voltage regulation of a 2000V, 1-phase alternator giving a current of 100A at unity power factor. From the synchronous impedance method test results,full load current is 100A and is produced by a short circuit by a field excitation of 2.5A and an electromotive force of 500V is produced on open circuit by the same excitation. The armature resistance is 0.8 Ohm.

11.a). Explain synchronous impedance method to determine voltage regulation of an alternator. [5M]
b) A 1500 KVA, 6600V 3 phase star connected alternator with a resistance of 0.4 ohm and reactance of 6 ohm per phase, delivers full load current at power factor 0.8 lagging, and normal rated voltage. Estimate the terminal voltage for the same excitation and load current at 0.8 power factor leading. [5M]

UNIT-V

1.a) What are the advantages of load sharing? [4M]
b) Explain the role of synchronous generators operation when connected to an infinite bus.[6M]

2. a) What is the effect of changing input for alternators operating in parallel?
b) Deduce an expression for the synchronizing torque on no load of a 3-phase synchronous machine in terms of the line voltage V, the short circuit line current Isc, the electrical angle of displacement Θ and the speed n in rev per sec.

3. Explain different synchronization methods used for synchronizing alternators [5+5]M
b) Two alternators working in parallel supply a lighting load of 300 kW and a motor load aggregating to 5000 kW at a power factor of 0.71. One machine is loaded to 5000 kW at 0.8 power factor lagging. What is the load and power factor of the other machine?

4.a) Define autosynchronization. [4M]
b) What is synchronizing power and explain its role in load sharing during parallel operation?[6M]

5. What is the need for parallel operation of alternators? Explain the division of load between two parallel alternators

6.a) Derive the expression for load sharing between dissimilar alternators. [8M]
b) Two synchronous generators are connected to bus-bars having a constant voltage of $10000 \angle 0^0$V. Generator A has an induced e.m.f. of $13000 \angle 22.6^0$ V and a reactance of 2 ohm; generator B has an e.m.f of $12500 \angle 36.9^0$ V and a reactance of 3 ohms. Find the current, KW and KVAr supplied by each generator.

UNIT-VI

1.a) What is the difference between a synchronous motor and an induction motor? Explain.[5M]
b) What is pull out torque of a synchronous motor? [5M]

2. Describe the effect of varying excitation upon armature current and power factor of Synchronous motor when the input power to motor is maintained constant. [5+5]M

3. Explain the construction and working of a synchronous -induction motor. [4+6]M

4. a) Explain the various starting methods of synchronous motor. [6+4]M
b)A 2000 V, 3-phase star-connected synchronous motor has an effective resistance and synchronous reactance per phase of 0.2 ohms and 2.2 ohms respectively. The input is 800 kW at normal voltage and induced line e.m.f is 2500 V. Calculate line current and power factor

5.a) What could be the reasons for failure in starting a synchronous motor? Suggest different remedies.[5M]
b) What is hunting? Why is it essential to suppress hunting? Explain. [5M]

6. Draw and explain the phasor diagram of 3-phase synchronous motor when (**i**) it is over excited (**ii**) it is under excited. [10]

7. (a) What is a synchronous condenser? Explain its operation with the help of phasor diagram. What are its applications?
(b) What are the factors that cause hunting? What are the effects hunting? Explain the methods used to eliminate the hunting in synchronous motor