



**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY**  
**PUTTUR (AUTONOMOUS)**  
 Siddharth Nagar, Narayanavanam Road - 517583

### **QUESTION BANK (Descriptive)**

**Subject with Code :**Electrical Machines-II (19EE0208)

**Regulation:** R19

**Course & Branch:** B.Tech-EEE

**Year &Sem:** II-B.Tech& I-Sem

### **UNIT - I**

### **3-PHASE INDUCTION MOTORS**

1. (a) Explain the principle of operation of Induction motor. [L2][CO1] [6M]  
 (b) A three phase induction motor is wound for 4 poles and is supplied from 50 HZ System. Calculate (a) synchronous speed (b) speed of the motor when slip is 4% and (c) Rotor current frequency when the motor runs at 600rpm. [L3] [CO1][6M]
2. Describe the constructional details of cage and wound rotor induction machines. [L2][CO1][12M]
3. Explain how rotating magnetic field of constant amplitude is produced. [L2] [CO1][12M]
4. A 4 pole, 3-phase induction motor operates from a supply whose frequency is 50Hz. Calculate.
  - i) The speed at which the magnetic field of the stator is rotating.
  - ii) the speed of the rotor when the slip is 0.04
  - iii) the frequency of the rotor currents when the slip is 0.03
  - iv) the frequency of the rotor currents at standstill.
  - v) speed of the rotor when the slip is unity . [L3] [CO1] [12M]
5. Derive the following (i) Torque equation of an induction motor (ii) Condition for Maximum Torque under running condition? [L2] [CO1] [12M]
6. Explain the Torque-Slip and Torque Speed characteristics of an 3-phase Induction motor.[L2] [CO1] [12M]
7. A 50HZ, 8 pole induction motor has full load slip of 4%. The rotor resistance and standstill reactance are 0.01  $\Omega$  and 0.1  $\Omega$  per phase respectively. Find (i) the speed at which maximum torque occurs and (ii) the ratio of the ratio of maximum torque to full load torque. [L3] [CO1] [12M]
8. A 6-pole,50HZ,3-phase induction motor running on full load develops a useful torque of 160 N-m and the rotor e.mf is absorbed to make 120 cycles/min .Calculate the net mechanical power developed .if the torque loss in windage and friction is 12N-m,Find the copper loss in the rotor windings ,the input to the motor and efficiency . Give Stator losses=200W(inclusive of core loss). [L3] [CO1] [12M]
9. (a)From fundamentals, deduce a relationship between Rotor power input, rotor copper loss and mechanical power developed in case of Induction motor. [L2] [CO1] [6M]  
 (b) Explain various losses in an induction motor and draw power flow diagram? [L2] [CO1] [6M]
- 10.(a)Develop the Equivalent circuit of a poly phase induction motor. [L2] [CO1] [6M]  
 (b) The input power to a 6-pole, 3-phase, 50HZ induction motor is 42KW and the speed is 970rpm. The Stator losses are 1.2KW and the friction and windage losses are 1.8KW. Find (i) rotor cu loss and (ii) the efficiency of the motor. [L3] [CO1] [6M]

**UNIT- II**  
**TESTING OF 3 PHASE INDUCTION MOTORS &**  
**SPEED CONTROL OF 3 PHASE INDUCTION MOTORS**

1. Explain brake test on 3-phase induction motor and list out limitations. [L2][CO2][12M]
2. Explain how to predetermine the performance of induction motor from no-load and blocked rotor tests. [L2][CO2][12M]
3. Explain the procedure to construct circle diagram to find performance characteristics of three phase induction motor. [L2][CO2][12M]
4. A 3-phase, 6-pole, 50Hz induction motor takes 60A at full-load speed of 940rpm and develops a torque of 150 N-m. The starting current at rated voltage is 300A. What is the starting torque? If a star/delta starter is used, determine the starting torque and starting current. [L3][CO2][12M]
- 5.(a) With the help of circuit diagram explain Auto Transformer starting of Induction motor. [L2][CO2][6M]
- (b) A Three phase induction motor has a ratio of maximum torque to full load torque as 2.5:1 .determine the ratio of starting torque to full load torque if star-delta starter is used. The rotor resistance and standstill reactance per phase are  $0.4\Omega$  and  $4\Omega$  respectively. [L3][CO2] [6M]
6. Explain cascade connection method of speed control of 3-phase IM with neat diagram. [L2][CO3][12M]
7. (a) Briefly explain the working of star delta starter with a neat diagram [L3][CO2] [6M]
- (b) Two 50 Hz, 3- $\Phi$  induction motor having 8 and 4-poles respectively are cumulatively cascaded. The 6-pole motor being connected to the main supply. Determine frequencies of rotor currents and the slips referred to each stator field. If the set has slip of 5%. [L3][CO3] [6M]
8. Write short notes on Injection of emf into the rotor circuit to control speed . [L2][CO3][12M]
9. A 4 pole , 50Hz, 3 phase induction motor has rotor resistance of  $0.2\Omega$  per phase and rotor stand still reactance of  $1\Omega$  per phase. On full load it is running with a slip of 4%, calculate the extra resistance required in the rotor circuit per phase to reduce the speed to 1260 r.p.m, on the same load condition. [L3] [CO2][12M]
10. (a) Explain the V/f control methods of the speed control of induction motor is achieved from stator side? [L2][CO3][6M]
- (b) A cascaded set consists of 2 motors 4-pole and 6-poles respectively. The Supply frequency is 50 Hz , While the frequency in rotor circuit of 6 pole motor s 1Hz. Determine the slip of each machine and combined speed of the set. [L3][CO3][6M]

**UNIT -III**  
**SYNCHRONOUS MACHINES-I**

1. Explain the constructional features of synchronous generator with neat sketches. [L2][CO4][12M]
2. (a) Derive EMF equation of an alternator. [L2][CO4][6M]  
(b) A 3-phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. It is driven at 375 rpm. The line value of Emf available across the terminals is observed to be 2.657KV. Find the frequency of the induced emf and flux per pole. [L4][CO4][6M]
3. Explain the principle of operation of synchronous generator and draw its equivalent circuit. [L2][CO4][12M]
4. (a) Define voltage regulation of synchronous generator. [L2][CO4][6M]  
(b) Derive the expression for voltage regulation when synchronous generator is supplying lagging power factor load. [L2][CO4][6M]
5. A 1200KVA, 6600V, 3-phase star connected alternator has its armature resistance as  $0.25\Omega$  per phase and its synchronous reactance as  $5\Omega$  per phase. Calculate its regulation if it delivers a full load at (i) 0.8 lagging and (ii) 0.8 leading p.f. [L3][CO4][12M]
6. Explain the procedural steps to find voltage regulation of synchronous generator by Synchronous Impedance Method. [L2][CO4][12M]
7. Explain the procedural steps to find voltage regulation of synchronous generator by MMF method. [L2][CO4][12M]
8. Draw the phasor diagram of Salient Pole Synchronous Machine and explain the concept of direct axis reactance and quadrature axis reactance. [L2][CO4][12M]
9. Explain the steps involved to find  $X_d$  and  $X_q$  from Slip Test. [L2][CO4][12M]
10. A 3 phase, 440V, 50Hz, delta connected alternator has direct axis and quadrature axis reactances of  $0.12\Omega$  and  $0.09\Omega$  respectively. If the alternator supplies 900A at 0.8 pf lagging, calculate (a) The excitation e.m.f. neglecting saliency ( $X_q = X_d$ ) (b) The excitation e.m.f. considering saliency. Neglect armature resistance. [L4][CO4][12M]

**UNIT -IV**  
**SYNCHRONOUS MACHINES-II**

1. a) Explain the theory of operation of synchronous motor . [L2][CO5][6M]  
b) Compare between synchronous motor and 3-phase induction motor. [L2][CO5][6M]
2. Draw and explain the phasor diagram of synchronous motor and derive the back EMF. [L2][CO5][12M]
3. An induction motor ,driving a load ,takes 350KW at 0.707 p.f. lagging .An over excited synchronous motor is then connected in parallel with the induction motor , taking power of 190 KW . if the overall p.f. of the two motors combined is to be 0.9 lagging , calculate KVA rating of synchronous motor. [L3][CO6][12M]
4. Write short notes on (a) Synchronous condenser [L2][CO5][6M]  
(b) Hunting and elimination of hunting [L2][CO5][6M]
5. The input to a 3-phase, 11KV, 50Hz star connected synchronous motor is 60A . The effective resistance and synchronous reactance per phase are  $1\Omega$  and  $30\Omega$ , respectively. Find (i) Power supplied to the motor (ii) Induced emf /phase at 0.8PF lagging and 0.8PF leading . [L3][CO5][12M]
6. Briefly discuss about the starting methods of synchronous motor with suitable diagrams. [L2][CO5][12M]
7. a) A 750 KW,11KV, 3-phase star connected synchronous motor has a synchronous reactance of  $35\Omega$ /ph and negligible resistance .Determine the excitation e.m.f. per phase when the motor is operating on full load at 0.8 p.f leading. Its efficiency under this condition is 93%. [L3][CO5][6M]  
b) Explain the working operation of synchronous induction motor. [L2][CO5][6M]
8. Explain the variation of current and power factor with excitation with suitable curves. [L2][CO6][12M]
9. Derive the expression for power developed by the synchronous motor. [L3][CO5][12M]
10. A 400V ,3 phase ,star connected synchronous motor has an armature resistance of  $0.2\Omega$  per phase and synchronous reactance of  $2\Omega$  per phase . While driving a certain load ,it takes 25A from the supply. Calculate the back E.m.f induced in the motor if it is working with (i) 0.8 lagging (ii) 0.9 leading and (iii) unity power factor conditions. [L3][CO5][12M]

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**UNIT-V**  
**SPECIAL MOTORS**

1. Discuss the working operation of A.C Series motor? What are the drawbacks? [L2][CO5][12M]
2. Explain the working operation of Universal motor and list out the applications [L2][CO5][12M]
3. Explain the working operation of Hysteresis motor and list out the applications [L2][CO5][12M]
4. Explain the working and performance characteristics of permanent Magnet D.C motor. [L4][CO5][12M]
5. Explain the construction and working operation of permanent Magnet A.C motor.
6. Explain the working principle of reluctance motor and Draw torque –speed characteristics. [L2][CO5][12M]
7. a) Explain the phasor Diagram of A.C Series Motor. [L2][CO5][6M]  
 b) A 220V, 500W, 50Hz series motor has a total resistance of  $2\Omega$  and total reactance of  $20\Omega$ . The full load stray losses and speed are 40W and 500r.p.m. Determine the current taken by the motor and power factor at rated load. [L3][CO5][6M]
8. Explain the construction and working operation of permanent magnet stepper motor. [L2][CO5][12M]
9. Explain the static and dynamic characteristics of stepper motor. [L2][CO5][12M]
10. A universal motor has a resistance of  $30\Omega$  and an inductance of  $0.5H$ . When connected to a 250V d.c supply and loaded to 0.8A, it runs at 2000 r.p.m. determine the speed, torque and power factor when connected to 250V, 50 Hz A.C supply and loaded to take same amount of current. [L3][CO5][12M]

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**Prepared By: V.MANASA**