

**[Total No. of Printed Pages:2]**  
**CODE NO:- U-54**  
**FACULTY OF ENGINEERING**  
**Second Year (EEP/EEE/EE) Examination**  
**DECEMBER - 2014**  
**AC Machines**  
**(Revised)**

[Time: **THREE Hours**]

[Max. Marks: **80**]

“Please check whether you have got the right question paper.”

**N.B**

- 1) Q.1 and Q.6 is compulsory
- 2) Solve any two questions from Q no 2 to Q no 5
- 3) Solve any two questions from Q. no 7 to Q. no 10
- 4) Assume suitable data if required

**SECTION A**

- |     |   |  |    |
|-----|---|--|----|
| Q.1 |   | Attempt any five   | 10 |
|     | 1 | A 3 phase, 4 poles, 50HZ, induction motor runs at 1400rpm. Determine its percentage slip.  |    |
|     | 2 | What is meant by single phasing  |    |
|     | 3 | How is the mechanical power output represented in the circuit model of an induction motor?   |    |
|     | 4 | Why does slip vary with load   |    |
|     | 5 | Mention the types of starters  |    |
|     | 6 | What is meant by plugging  |    |
|     | 7 | On what factors does the speed of an induction motor depend  |    |
|     | 8 | Mention any two applications of hysteresis motor.  |    |
|     |   |  |    |
| Q.2 | A | Explain the cascade management for controlling speed of three phase induction motor  | 05 |
|     | B | Draw and explain equivalent circuit of double cage motor.  | 05 |
|     | C | A 50HZ, 4 poles, 3 phase induction motor has rotor current frequency of 2 HZ. Obtain slip and speed of motor.  | 05 |
|     |   |  |    |
| Q.3 | A | Derive the approximate equivalent circuit of a 3 phase induction motor.  | 05 |
|     | B | Develop the equivalent circuit for a 3 phase induction motor.  | 05 |
|     | C | A 3 phase induction motor has starting torque of 100% and a maximum torque of 200% of the full load torque. Find slip at maximum torque.                               | 05 |
|     |   |  |    |
| Q.4 | A | Explain the working of double cage induction motor.  | 05 |
|     | B | Give the applications of 3 phase induction motor and single phase induction motor  | 05 |
|     | C | Draw the equivalent circuit of single phase induction motor describing all the parameters.   | 05 |
|     |   |  |    |
| Q.5 | A | A double cage motor has standstill impedance of $(1 + j1) \Omega$ and $(0.3 + j5) \Omega$ for its two cages. Compare the relative torques of two cages at slip of 0.05 | 05 |
|     | B | Explain the construction of AC servomotor.   | 05 |
|     | C | Describe the operating principles of FHP synchronous motor.  | 05 |

**SECTION B**

- |     |   |  |    |
|-----|---|--|----|
| Q.6 |   | Attempt any five   | 10 |
|     | 1 | What are the essential elements for generating emf in alternator?                      |    |
|     | 2 | What will be the number of poles of a 50HZ alternator if it runs at its greatest speed |    |
|     | 3 | What is an exciter?  |    |
|     | 4 | What is meant by armature reaction of a synchronous machine                            |    |
|     | 5 | What is the use of a synchronous condenser   |    |
|     | 6 | What are the advantages of synchronous motor?  |    |
|     | 7 | What is the effect of increase in excitation of a synchronous motor?                   |    |
|     | 8 | Why a 3 phase synchronous motor will always run at synchronous speed                   |    |

Q.7	A	Find the value of $k_d$ for an alternator with 9 slots per pole for the following cases: i) One winding in all the slots      ii) one winding using only the first $\frac{2}{3}$ of the slot/pole. iii) three equal winding placed sequentially in $60^\circ$ group	05
	B	Derive the induced emf equation for an alternator	05
	C	Explain the effect of harmonics on pitch and distribution factor of an alternator.	05
Q.8	A	An alternator on open circuit generates 360V at 60HZ when the field current is 3.6A. neglecting saturation determine the open circuit emf when the frequency is 50HZ and field current is 2.4.A	05
	B	Explain the procedure of determining of voltage regulation of alternator.	05
	C	Mention the procedural steps for <b>potier</b> method.	05
Q.9	A	Derive the equation for the power developed by a synchronous generator	05
	B	Explain the synchronizing of three phase alternator.	05
	C	A 3 phase y connected syn. Generator supplies current of 10A having phase angle of $30^\circ$ lagging at 400V. Find the load angle and the components of armature current $I_d$ and $I_q$ if $x_d = 10\Omega$ $x_q = 6.5$ ohm. Assume armature resistance to be negligible	05
Q.10	A	Explain the power flow within a synchronous motor.	05
	B	Explain the different torques of a synchronous motor.	05
	C	Explain the effect of excitation on power factor in syn. Motor.	05