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**Question Paper Code : 31401**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Electrical and Electronics Engineering

EE 2302/EE 52/EE 1301/10133 EE 505 – ELECTRICAL MACHINES – II

(Regulation 2008/2010)

(Common to PTEE 2302 Electrical Machines II for B.E. (Part-Time)  
Fourth Semester Electrical and Electronics Engineering – Regulation 2009)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by armature reaction in Alternator?
2. Define the term voltage regulation of Alternator.
3. What is meant by hunting of a synchronous motor?
4. What are the uses of damper winding in synchronous motor?
5. Why are the slots on the cage rotor of induction motor usually skewed?
6. Define slip of an induction motor.
7. What are the different methods of starting 3-phase induction motor?
8. What is meant by slip power recovery scheme?
9. What are inherent characteristics of plain 1-phase induction motor?
10. State the double revolving field theory.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for the emf induced in an Alternator. (8)  
(ii) A 3-phase 16 pole alternator has star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.04 wb and is distributed sinusoidally. The speed is 375 rpm. Find the frequency, phase emf, and line emf. The coil span is 120° electrical. (8)

Or

- (b) List the methods used to pre determine the voltage regulation of synchronous machine and explain the MMF method. (16)

12. (a) The synchronous reactance per phase of a 3-phase, star connected 6600 V synchronous motor is  $20\ \Omega$ . For a certain load the input is 900 kW at normal voltage and the induced line emf is 8500 V. Determine the line current and power factor. (16)

Or

- (b) (i) Explain V curves and inverted V curves of a synchronous motor. (8)  
(ii) Draw and explain the equivalent circuit and phasor diagram of a cylindrical rotor synchronous motor operating at different power factors. (8)

13. (a) Draw the circle diagram of a 15 hp, 230 V, 50 Hz, 3-phase slip-ring induction motor with a star connected stator and rotor. The winding ratio is unity. The stator resistance is  $0.42\ \Omega$ /phase and the rotor resistance is  $0.3\ \Omega$ /phase. The following are the test readings,

No load test: 230 V, 9A, p.f. = 0.2143

Blocked rotor test: 115 V, 45 A p.f. = 0.454

Find

- (i) Starting torque  
(ii) maximum torque  
(iii) maximum power factor  
(iv) slip for maximum torque  
(v) maximum power output. (16)

Or

- (b) (i) Describe the construction and principle of operation of a 3-phase induction with neat sketch. (10)  
(ii) Derive the condition for maximum torque in 3-phase induction motor. (6)

14. (a) With neat diagrams, explain working of any two types of starter used for 3-phase squirrel cage induction motor. (16)

Or

- (b) (i) Explain the speed control of 3-phase wound rotor induction motor by rotor resistance method. (8)  
(ii) Explain in details the slip recovery scheme. (8)

15. (a) Explain with suitable diagram the working principle of split-phase and capacitor start induction motor. (8+8)

Or

- (b) Discuss briefly the operation and characteristics of  
(i) Repulsion motor (8)  
(ii) AC series motor. (8)