

5E3221

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Total No of Pages: **4****5E3221****B. Tech. V Sem. (Main / Back) Exam., Dec. 2014
Electrical and Electronics
5EX2 Electrical Machines-II****Time: 3 Hours****Maximum Marks: 80****Min. Passing Marks: 24***Instructions to Candidates:*

*Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL2. NIL**UNIT - I**

- Q. 1-(a) Derive the general equation of induced emf. What are the effects of the harmonics in generated emf?
- (b) Explain the following in brief:-
- (i) Chording
 - (ii) Skewing
 - (iii) Breadth factor
 - (iv) Pitch factor
- (c) Write short note on armature winding.
- (d) An alternator has 9 slots per pole. The coil span is 8 slots find the pitch factor for fundamental frequency.

[8]**[8]****[5E3221]**

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OR

- Q. 1 (a)** What is meant by distribution factor and pitch factor? Derive an expression for the distribution factor of winding in an alternator. [8]
- (b)** A 3- ϕ star connected alternator has the following data:- Voltage required to be generated on open circuit = 4000V at 50Hz, speed = 500rpm; stator slots / phase / Pde = 3; conductor / slot = 12 calculate:-
- (i) Distribution factor
- (ii) Useful flux per pole [8]

UNIT - II

- Q. 2 (a)** Discuss the principle of operation of 3-phase induction motor. How does an induction motor act as a transformer? [8]
- (b)** A 3-phase, 50Hz induction motor has a full load speed of 1440 rpm for this motor calculate.
- (i) No. of poles
- (ii) Full load slip
- (iii) Rotor frequency
- (iv) Speed of stator field with respect to stator structure. [8]
- (c)** What is a rotating magnetic field? Show that when three identical coils placed at 120° space are excited from 3-phase balanced current the resultant mmf will be rotating in nature with an amplitude 1.5 times that of each phase. [8]

OR

- Q. 2 (a)** How are the conditions of cogging and crawling produced in a 3- ϕ induction motor? How are these conditions avoided? [8]
- (b)** Derive the equation for torque of an induction motor under running condition. Find the condition for maximum torque under running condition. Draw torque slip characteristics. [8]

UNIT – III

- Q. 3 (a) What is principle of operation of single phase induction motor? Why it is not self starting ? (Explain in context of resolving field theory) [8]
- (b) Discuss different methods of the speed control of slip ring induction motor in brief. [8]
- (c) Using double revaluing field theory for single phase induction motor explain its torque slip characteristics and prove that it cannot produce any starting torque. Show that this motor can run in either direction if once started. [8]

OR

- Q. 3 (a) What are various methods of speed control of 3-phase induction motor? Explain the cascade connection of two three phase induction motor and derive the equation for its speed. [8]
- (b) What are the different methods, of braking of three phase induction motors, briefly explain them. [8]

UNIT – IV

- Q. 4 (a) Describe various schemes used for exciting large synchronous Machine which method is being preferred now these days for exciting very large turbo generator and why? [8]
- (b) Explain hunting and its prevention for synchronous machine in detail. [8]
- (c) Define voltage regulation of an alternator. Discuss ASA method of finding voltage regulation. [8]
- (d) A 3300 volt, stator connected synchronous motor has synchronous impedance of $(0.4 + j5) \Omega$ per phase for excitation emf of 4000volts and motor input power of 1000 watt at rated voltage calculate the line current and power factor. [8]

OR

- Q. 4 (a) Explain the term 'armature reaction'. Explain its effects on the main field of a synchronous generator at:
- (i) Unity power factor load

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- (ii) Zero lagging power factor load
- (iii) Zero leading power factor load [8]
- (b) What are conditions to be fulfilled for parallel operation of two synchronous? Explain any one method of synchronizing. [4]
- (c) Two identical 2MVA alternators operate in parallel. The governor of first machine is such that the frequency drops uniformly from 50Hz or no load to 47.5Hz on full load. The corresponding uniform speed drop of the second machine is 50Hz to 48Hz. How will they share a load of 3 MW? [4]

UNIT - V

- Q. 5 (a) What are the main characteristics of synchronous motors? Explain v-curves of synchronous motor?
- (b) What is synchronous condenser? How does it improve the efficiency and regulation of a system? [8]
- (c) What are the types of synchronous motors? Explain working principle and equivalent circuit of the synchronous motor?
- (d) Discuss various application of synchronous motor is briefly. [8]

OR

- Q. 5 (a) Explain briefly the effect of varying excitation upon the armature current and power factor of a 3-phase synchronous motor when input power to the motor is maintained constant. [8]
- (b) Draw the equivalent circuit and phase diagram and derive the expression of electromagnetic power developed by a cylindrical rotor synchronous motor. [8]

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