Reg. No. : ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Question Paper Code : 21417

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Third Semester

Electronics and Instrumentation Engineering

EI 2201/EI 33/EE 1202/10133 EI 303/080300001 – ELECTRICAL MACHINES

(Common to Instrumentation and Control Engineering)

(Regulation 2008/2010)

(Also common to PTEI 2201 — Electrical Machines for B.E.(Part - Time) Second Semester Electronics and Instrumentation Engineering - Regulation 2009)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   State the conditions which determines if a DC machine is generating or motoring.

2.   Write the voltage equation of DC motor.

3.   Write the condition for maximum efficiency of a transformer.

4.   Why an open circuit test is generally performed at rated voltage on LV side of a transformer?

5.   State the relationship between the rotational speed of rotor, the frequency of generated emf and the number of poles in an laternator.

6.   List the applications of synchronous motor.

7.   State the torque equation of 3-phase Induction motor at running condition.

8.   Define the term 'slip' of an 3-phase induction motor.

9.   Brief the working principle of universal motor.

10. What are the advantages of brushless DC motor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the EMF equation of DC generator. (8)

    (ii) Explain the procedure for obtaining internal and external characteristics of a separately excited DC generator. (8)

Or

    (b) (i) Derive the torque equation of DC motor. (8)

    (ii) Explain the speed– torque characteristics of a DC series motor and mention why the DC series motor should not be started without any load. (8)

12. (a) (i) Explain the construction and working principle of a transformer. (8)

    (ii) Draw and explain the phasor diagram of a single-phase transformer supplying

    (1) a lagging load

    (2) a leading load and

    (3) a Upf load. (8)

Or

    (b) (i) Define the term 'voltage regulation' of a transformer and derive the expression for voltage regulation. (6)

    (ii) Explain how equivalent circuit of single phase transformer can be obtained from open circuit and short circuit test. (10)

13. (a) (i) Derive the equation of induced emf for an alternator. (8)

    (ii) Draw and explain the vector diagrams of a loaded alternator. (8)

Or

    (b) (i) Derive the torque equation of synchronous motor. (8)

    (ii) Describe the phenomenon of 'hunting' in a synchronous motor. (8)

14. (a) (i) Explain the principle of operation of a three-phase induction motor. (8)

    (ii) Derive the condition for maximum torque of an induction motor at starting condition. (8)

Or

    (b) Explain the following starters used for starting a three-phase squirrel cage induction motors :

    (i) auto-transformer starter (8)

    (ii) star-delta starter (8)

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15. (a) (i) Explain the principle of working of a single-phase induction motor with the help of cross field theory. (8)

(ii) Explain why no rotational torque is developed by a repulsion motor when the brushes are placed along the axis of the stator poles. (8)

Or

(b) Describe the construction and operation of a switched reluctance motor. Write the advantages of switched reluctance motor. (16)

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