Code: 9A02804

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

SPECIAL ELECTRICAL MACHINES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Draw and explain series and shunt boosters in detail.

2 Explain Rosenberg generator with neat diagram and draw its N-I curve.

3 Discuss the principle of operation of permanent magnet stepper motor with torque versus angle characteristics.

4 Derive the torque equation for variable reluctance stepper motor.

5 Discuss the various converter topologies for a 3-ø SRM with its merits and demerits.

6 Write the comparison between permanent magnet brushless DC motor and conventional DC motor.

7 Explain the double sided linear induction motor from rotator type IM with neat diagrams.

8 State the difference between conventional and electronically commutated DC motor.

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Answer any FIVE questions

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*****

1 Explain the following with neat diagrams:
(a) Series booster
(b) Constant current booster

2 A 2.5 KW, 200 V metadyne generator driven by a synchronous motor at 1500 r.p.m has the following constants:

- Control field resistance $\mathrm{R_f} = 20\Omega$
- Voltage constant $\mathrm{K_{af}} = 200\frac{\mathrm{V}}{\text{field A}}$
- Voltage constant $\mathrm{K_{qd}} = \mathrm{K_{dq}} = 100\mathrm{V/A}$
- Armature resistance $\mathrm{R_a} = 5\Omega$

The metadyne supplies a $20\ \Omega$ resistance at a voltage of $200\ \mathrm{V}$. Find the power input to the control field and power amplification for 50% compensation.

3 Explain the operation of $2\ \emptyset$ hybrid step motor.

4 Describe the operation of variable reluctance stepper motor.

5 With a neat diagram, describe in detail the microprocessor based controller in switched reluctance motor.

6 Draw the diagram of electronic commutator. Explain the operation of the same.

7 Explain the principle of operation of permanent magnet brushless DC motor with neat diagram.

8 (a) Write the assumptions to be made for field analysis of DSLIM.
(b) Draw the DSLIM diagram.

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3

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

SPECIAL ELECTRICAL MACHINES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

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*****

1 Explain the amplidyne and metadyne with neat diagram and draw its V-I curves.

2 Discuss the drive circuits of stepper motor in detail.

3 Derive the e.m.f and torque equation of permanent magnet brush less DC motor.

4 Draw and explain the characteristics of switched reluctance motor.

5 Draw and explain constant current booster in detail. Write the differences between reversible and non reversible boosters.

6 Explain linear induction motor for traction in detail with neat diagram.

7 Explain the characteristics of stepper motor.

8 Explain B-H loop in detail.

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4

B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

SPECIAL ELECTRICAL MACHINES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Draw and explain reversible and shunt type boosters in detail.

2 Write the principle of cross field rotating machines and explain any one type of armature excited machine in detail with neat diagram.

3 (a) Explain torque versus stepping rate characteristics of a stepper motor.
(b) What is stepping angle? Calculate the stepping angle for a 3-Ø 24 pole permanent magnet type stepper motor.

4 Explain the types of variable reluctance stepper motor in detail.

5 Explain the short position sensing of switched reluctance motor.

6 Draw the equivalent circuit of PM system with armature and write the equations used for finding the origin 'K' of the recoil line for PM without the armature.

7 Explain the magnetic circuit analysis of PM brushless DC motor.

8 The linear IM has 98 poles and a pole pitch of 50 cm. Determine the synchronous speed and vertical speed in Km/hr, if frequency is 50 Hz and slip is 0.25.

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