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Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES  
(AUTONOMOUS)**

M.E/M.Tech I-Semester Regular Examinations, November 2015

**Advanced Drives and Control**

**(Control Systems Engineering)**

**Date:**

**Time: 3 hours**

**Max Marks: 60**

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**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

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- 1 a) Explain the operation of the 1-ph fully controlled converter with RLE load, and derive the expressions for average and rms values of Voltage, Current, distortion factor, displacement factor and input power factor (6 M)
- b) A 220V, 875 rpm, 150 A, separately excited dc motor has an armature resistance of  $0.06 \Omega$ . It is fed from a 1-ph fully controlled converter with an ac source voltage of 220V, 50Hz. Assuming continuous conduction, calculate (6 M)
- (a) Firing angle for rated motor torque and 750rpm.  
(b) Firing angle for rated motor torque and (-500)rpm  
(c) Motor speed for  $\alpha = 160^\circ$  and rated torque.

(or)

- 2 a) Explain the operation of 1-ph dual converter fed dc motor with circulating and non-circulating current modes of operation (6 M)
- b) A 230 V, 960 RPM, and 200 A separately excited dc motor have an armature resistance of  $0.02\Omega$ . The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction. (6 M)
- (a) Calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm.  
(b) Calculate the duty ration of chopper for braking operation at rated torque and 350 rpm.

- 3 Derive the dynamic DQ model of 3-ph induction motor (12 M)

(or)

- 4 Derive the dynamic DQ model of a separately excited dc motor. (12 M)

- 5 a) Explain the slip power recovery schemes of 3-ph induction motor. (8 M)
- b) A 440V, 50 Hz, 6-Pole Y- Connected, wound rotor motor has following parameters.  $R_s=0.5\Omega$ ,  $R_r^1=0.4\Omega$ ,  $X_s=X_r^1= 1.2 \Omega$ .  $X_m = 50 \Omega$ . Stator to rotor turns ratio 3.5. The motor is controlled by static rotor resistance control. External resistance is chosen such that brake down torque is produced at stand still for a duty ratio of zero. Calculate the value of external resistance. How duty ration should be varied with speed so that the motor accelerates at maximum torque. (4 M)

(or)

- 6 a) Explain the V/F control of induction motor. (6 M)
- b) Explain the Rotor resistance control of 3-phase IM. (6 M)

- 7 Explain the direct-vector control of 3-ph induction motor. (12 M)

(or)

- 8 Explain Direct Torque Control of 3-phase Induction Motor. (12 M)

- 9 a) Explain the permanent magnet materials. (8 M)
- b) Explain the operation of wound field machine drives. (4 M)

(or)

- 10 a) Explain the operation of switched reluctance motor. (6 M)
- b) What is the difference between PMSM and BLDC motors? What are the merits of Permanent magnet synchronous motors over conventional synchronous motors? (6 M)