Registration No: | | | | | | | | | | |

Total Number of Pages:02 **M.TECH**

P2PDCC02

2nd Semester RegularExamination 2016-17

Advanced Electrical Drive

BRANCH: ELECTRICAL AND ELECTRO ENGG, INDUS. POWER CONTROL AND DRIVES (PT), POWER ELECTRO, POWER ELECTRO & DRIVES, POWER ELECTRO AND ELECTRICAL DRIVES

Time: 3 Hours

Max Marks: 100

Q.CODE:Z468

Answer Question No.1 which is compulsory and any FOUR from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) What is the advantage of vector control over scalar control of induction motor drive?

b) What is the advantage of designing controller in synchronously rotating reference frame?

c) What is the speed of the rotor flux linkage phasor with respect to rotor axis?

d) How does direct self control get its position information?

e) Why is the rotor flux synthesis based on the reference model difficult to implement at low speed of induction motor drive?

f) What are the consequences of mismatch between the vector controller and the induction motor?

g) How is flux reference generated in case of Direct Torque Control (DTC) Induction motor drive?

h) What is the advantage of speedsensorless control over sensor based control of induction motor drive ?

i) How are torque and flux affected during null vector duration in case of Direct Torque controlled induction motor drive?

j) What is the shape of the wave form of the induced stator voltage in case of Permanent Magnet Brushless DC Motor?

Q2 **a)** Give the complex valued d-q model of induction machine. Derive the relevant equations and represent the equivalent circuit. **(10)**

b) Explain the rotor flux oriented control of current regulated induction machine with the relevant control block diagram and phasor diagram. What are the advantages of this control method? **(10)**

Q3 **a)** Explain the principle of operation of Direct Vector Control induction motor drive with relevant block diagram and phasor diagram. **(10)**

b) Explain the principle of rotor flux oriented vector control of induction motor with relevant control block diagram and phasor diagram. Give a method of rotor flux estimation in this control strategy. **(10)**

Q4 **a)** How is indirect vector control implemented in 3 phase induction motor? Explain the control principle with suitable block and phasor diagram. **(10)**

b) Discuss the inverter voltage vector oriented vector control of three phase induction motor with relevant circuit and phasor diagram. **(10)**

Q5 **a)** Which is the most significantly changing parameter in the induction motor and why? Explain the torque feedback control to overcome the effects of parameter sensitivity of the induction motor drive with control block diagram. **(10)**

b) Explain the control strategy adopted in the over-speed region of induction motor drive giving suitable diagram. **(10)**

Q6 **a)** Explain the principle of operation of Switched Reluctance motor drive with relevant circuit diagram, control block diagram and waveform. **(10)**

b) Give the principle of Model Reference Adaptive System (MRAS) based speed estimation as applied in sensorless vector control of induction motor. Outline the merits and demerits of this speed estimation technique. **(10)**

Q7 **a)** Explain the principle of operation of Direct Torque Control induction motor drive with relevant block diagram and phasor diagram. **(10)**

b) Why surface mount permanent magnet synchronous machines have very little difference between direct axis and quadrature axis inductances? Explain with relevant diagram. **(10)**