Ref No: Ex/PG/EE/T/129A/2017

M.E. ELECTRICAL ENGINEERING - FIRST YEAR - SECOND SEMESTER

(1st / 2nd Semester/Repeat/Supplementary/Annual/Bi-Annual)

SUBJECT: - ADVANCED ELECTRIC DRIVES

Time: Three hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART I	Marks
	Answer any Two Questions	
Q1.	a) Compare the advantages and disadvantages of a vector controlled drive system of induction machines with scalar control system.	6
	b) Explain how the field orientation can be achieved knowing the stator voltage and current information in case of a stator flux oriented control scheme. Also show the closed loop block diagram for the scheme.	7+5
	c) How the speed and current sensing can be done for the above induction motor drive system?	4+3
Q2.	a) With the help of model equations, develop the block diagram of an indirect rotor field oriented control scheme and explain the same.	15
	b) Explain why transformation of input voltage and currents from three phase to two phase in stationary reference frame and then to synchronously rotating frame is necessary for the analysis of three phase induction motor.	10
Q3.	a) Explain the basics of direct torque control (DTC) scheme of a three phase induction motor drive system. From the basic principle develop the control block diagram for the same and explain the type of controllers used for this method.	15
	b) A 415V, 8-pole 50 Hz, 2.2kW, 720 rpm star connected three phase induction motor is controlled with v/f technique. Assuming constant slip speed, calculate the applied voltage and frequency for the speed commands of (i) 100 rpm and (ii) 600 rpm and (iii) 1000 rpm.	10

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Ex/PG/EE/T/129A/14/2017

MASTER OF ENGINEERING IN ELECTRICAL ENGINEERING

EXAMINATION, 2017 (2nd Semester)

ADVANCED ELECTRIC DRIVES

Time: Three hours Full Marks: 100 (50 marks for each Part)

Use a separate Answer-Script for each Part

PART-II

Answer any ***three*** questions

Two marks reserved for neat and well organized answer

1. a) What is IaRa compensation in dc motor drive without speed feedback ? Sketch and explain the principle of closed loop speed control of a DC motor using IaRa compensation method. 8

   b) Sketch and explain the principle of closed loop speed control of a DC motor using dual feedback loops with speed and current feedback. 8

2. a) Derive to show that the torque-speed curves of an induction motor under constant flux are straight lines, parallel to each other. Justify all steps. 12

   c) Explain how the starting torque of an induction motor of given hp rating can be made high without increase in stator current like a dc series motor. 4

3. a) Sketch and explain the principle of speed control of an Induction motor using slip compensation, where speed feedback is not used. 8

   b) Sketch and explain the principle of speed control of an Induction motor using speed feedback. 8

4. a) Explain the effects of harmonics on induction motor flux, core loss and copper loss. 6

   b) Explain the effects of harmonics on induction motor torque. 10

5. a) Sketch what is known as Sinusoidal Pulse Width Modulated voltage waveform for an induction motor drive. Explain what are the characteristics and advantages of it. 8

   b) What is the range of speed (with respect to rated speed) over which motor drives are normally operated and for what reason ? On this range, explain the regions of constant flux, constant torque and constant hp. 8