Library

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

Re-Examination.

June 2017

Program: M. Tech Electrical Engineering

Date: 20/06/2017

Course code: MTPX 122

Duration: 4 hr.

Maximum Marks: 100

Name of the Course: Advanced Control of Electrical Drives

Semester: II

Master file.

Instructions:

(i) Question no. 1 is compulsory.
(ii) Attempt any four from the remaining questions
(iii)Assume suitable data if required.

Q. No.	Description	Marks	C.O. No.	Module No.
Q. 1 a	What are the advantages of A.C over D.C drives?	5	1	1
Q. 1 b	Give two applications (any) of Electrical drives and also specify the drive for each.	5	1,2	1,3,4,5
Q. 1 c	Why decoupling is essential in Vector control of motors?	5	5	5
Q. 1 d	Suggest any method to provide brushless D.C. Excitation of Synchronous motor.	5	1,4	7
Q. 2 a	With the Principles of phase control theory explain single phase half-controlled rectifier control and three phase fully controlled rectifier control of separately excited motor.	10	2,3	2
Q. 2 b	A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 Ω and	10	3,4	2

	inductance of 0.8 mH. It is fed from a single phase fully-controlled rectifier with an ac source voltage of 220 V, 50 Hz. Calculate (i) Motor torque for $\propto = 65°$ and speed = 400 rpm. Note : Use the details for w_{mc}, K and β if necessary $$w_{mc} = \frac{R_a V_m}{ZK}\sin(\alpha - \emptyset)\left[\frac{1 + e^{-\pi \cot \emptyset}}{e^{-\pi \cot \emptyset} - 1}\right]$$ $$K = \frac{E}{w_m} \; ; \; \beta = 230$$ (ii) If the drive is found in discontinuous conduction mode, suggest a solution to the region of discontinuous conduction. With calculations prove the same.			
Q. 3 a	Develop a state space model and time block diagram of shunt connected DC motor.	10	3	3
Q. 3 b	Explain Closed loop control of Chopper fed D.C. drive.	05	3	3
Q. 3 c	For a chopper fed 230V, 960 rpm, 200 A separately excited D.C. motor with armature resistance 0.02Ω, calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm.	05	3	3
Q. 4 a	Explain V/f method for speed control of induction motor.	10	4	4
Q. 4 b	What are the benefits of using Current-Fed Inverter Control for speed control of induction motor. Explain the same with the block diagram.	10	4	4
Q. 5 a	A Y-connected squirrel-cage induction motor has following rating and parameters: 400V,50 Hz, 4-pole,1370 rpm, R_s =2Ω, R_r' =3Ω, $X_s = X_r'$ =3.5 Ω, X_m =55 Ω.	10	4	4

	It is controlled by a current source inverter at a constant flux. Calculate motor torque, speed and stator current when operating at 40 Hz and rated slip speed.			
Q. 5 b	Explain Direct Torque Control (DTC) method of speed control of induction motor.	10	3,4	6
Q. 6 a	Explain vector control method (any one method) of speed control of Induction motor.	10	5	5
Q. 6 b	Compare stator oriented flux control and rotor oriented flux control. Drawbacks of each and solution methods to overcome these drawbacks	10	5	5
Q. 7 a	A Space Vector PWM VSI, having a DC supply of 400 V and a switching frequency of 2.5kHz, is required to synthesize voltage $V_s^* = 210\angle 200\ ^\circ$ V. Calculate the time of switching of the space vectors. Also draw the sequence of switching.	10	5	2
Q. 7 b	What is the basic difference between the Vector control of induction motor and vector control of synchronous motor? Why Absolute position encoders are required for speed control of synchronous motor?	10	5	5,7