Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May – 2017**

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **14EE3005** | **Duration :** | **3hrs** |
| **Sub. Name** | **SOLID STATE AC DRIVES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | Draw different operating characteristics curve for the Induction motor drive and explain the regions. | CO1 | 10 |
| b. | Compare the performance of Induction motor with and without harmonic content in the supply. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Determine the current vs slip characteristics for phase-controlled induction motor drive whose details are given below,  150hp, 460V, 3 phase, 60 Hz, 4 poles, star connected, Rs = 0.03 Ω, Rr = 0.22 Ω, Xm = 10.0 Ω, X1s = 0.1 Ω, X1r = 0.12 Ω, full load slip = 0.1477,  Friction and windage losses = 0.01ωm +0.0005 ωm2 N-m.  Assume frictional load and evaluate the load constant based on the fact that 0.2p.u. Torque is developed at 0.7 p.u. speed. | CO1 | 15 |
| b. | Outline the steps involved in the evaluation of steady state performance of induction motor. | C01 | 5 |
| 3. | a. | With block diagram, explain the Closed Loop Variable Frequency PWM Inverter for Induction motor drive. | C01 | 10 |
|  | b. | Calculate the value of the starting torque and current of the AC drives, for the stable operation at the frequency of 15Hz at constant V/f ratio. A Y-connected squirrel-cage IM has following ratings and parameters: 400 V, 50Hz, 4-pole,1370 rpm, Rs=2 Ω, R ʹr = 3 Ω, Xs=Xʹr=3.5 Ω. | C01 | 10 |
| (OR) | | | | |
| 4. | a. | With the help of torque speed curves, explain the method to avoid the air gap flux saturation in Induction motor. | CO2 | 10 |
|  | b. | Select the suitable method to control the speed of Slip ring IM to get the smooth and step less operation of IM drive and explain. | CO2 | 10 |
| 5. | a. | Compare the performance of Induction Motor Drive using Voltage Source Inverter and Current Source Inverter. | CO2 | 10 |
|  | b. | Discuss about the power factor consideration in Modified Kramer Drive and explain its working principle. | CO2 | 10 |
| (OR) | | | | |
| 6. |  | A 440V, 50Hz, 6-pole,970 rpm, Y –connected wound rotor IM which has the following parameters referred to the stator side ,Rs=0.1Ω, R ʹr = 0.08Ω, Xs= 0.3 Ω, Xʹr= 0.4Ω, the stator to rotor turns ratio is 2, dc link inductor has a resistance of 0.01 Ω. Motor speed is controlled by Static Scherbius Drive. Drive is Designed for a speed range of 35% below the synchronous speed. Maximum value of firing angle is 165°.  Determine   1. Transformer turns ratio 2. Torque for a speed of 780 rpm and = 140°   iii) Select the firing angle to get half the motor torque and the speed of 800 rpm | CO2 | 20 |
| 7. |  | Describe the Sensorless Vectro Control methods for Induction Motor Drive which is essential for the Industries. | CO1 | 20 |
| (OR) | | | | |
| 8. | a. | With neat Block Diagram, explain the method to regulate the active and reactive currents independently in industries using Vector Control Method. | CO3 | 10 |
|  | b. | Derive the Torque Expression of IM as a function of the stator and rotor fluxes in Direct Torque Control Method for commercial product developing companies. | CO3 | 10 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Explain the Field oriented Control of Induction Motor using DC Drive Analogy. | CO3 | 10 |
|  | b. | Discuss about the Feedforward vector control of IM drive which is popular for industrial applications. | CO3 | 10 |

ALL THE BEST