|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |

**C Reg. No. :**

**Question Paper Code: 51P51**

M.E. DEGREE EXAMINATION, NOV 2017

First Semester

Power Electronics and Drives

15PPE101 - ANALYSIS OF ELECTRICAL MACHINES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | Fringing at short air gap in magnetic circuit is empirically accounted for by | | | | | | | | CO1- R | | | |
|  | (a) Increasing the linear dimensions of the gap  area by twice the gap length | | | | | (b) Increasing the linear dimensions of the  gap area by one gap length | | | | | | |
|  | (c) Increasing the linear dimensions of the gap  area by half gap length | | | | | (d) Increasing the linear dimensions of the  gap area by one fourth gap length | | | | | |
| 2. | The motion of a magnetic moment immersed in these fields is analyzed by the use of | | | | | | | | CO2 -R | | | |
|  | (a)Rotating reference frame | | | | | (b) Static reference frame | | | | | | |
|  | (c) Arbitrary reference frame | | | | | (d) Mutual reference frame | | | | | | |
| 3. | The frequency of rotor currents at standstill is equal to | | | | | | | | CO3- R | | | |
|  | (a) Zero | | | (b) 2*f* | | | (c) *f* | | (d) *sf* | | | |
| 4. | A Synchronous Machine with low value of short circuit ratio has | | | | | | | | CO4 -R | | | |
|  | (a) Good speed regulation | | | | | (b) Good voltage regulation | | | | | | |
|  | (c) Higher stability limit | | | | | (d) Lower stability limit | | | | | | |
| 5. | If the frequency of three phase supply to the stator of three phase induction motor is increased then synchronous speed is | | | | | | | CO5- R | | | | |
|  | (a) Increased | | (b) Decreased | | (c) Remain unchanged | | | (d) None of the above | | | | |
|  | PART – B (5 x 3= 15Marks) | | | | | | | | | | | |
| 6. | Represent graphically field energy and co energy. CO1-U | | | | | | | | | | | |
| 7. | State the importance of reference frame theory. CO2-U | | | | | | | | | | | |
| 8. | Form the state equations of DC machine. CO3-App | | | | | | | | | | | |
| 9. | State transient stability limit for synchronous machines. CO4-U | | | | | | | | | | | |
| 10. | Sketch the equivalent circuit of an induction motor. CO5-U | | | | | | | | | | | |
|  | PART – C (5 x 16= 80Marks) | | | | | | | | | | | |
| 11. | (a) | Derive the general expression for a single excited electromagnetic system. | | | | | | | | CO1-App | (16) | |
|  |  | Or | | | | | | | |  |  | |
|  | (b) | Derive the expression for force and torque developed in a doubly excited magnetic field system with respect to field energy and  co energy. | | | | | | | | CO1- App | (16) | |
|  |  |  | | | | | | | |  |  | |
| 12. | (a) | Explain the Principle, merits and demerits of synchronous reference  Frame theory. | | | | | | | | CO2- U | (16) | |
|  |  | Or | | | | | | | |  |  | |
|  | (b) | Derive the expression for the balanced steady state phasor and voltage equation of transformation variables | | | | | | | | CO2- App | (16) | |
|  |  |  | | | | | | | |  |  | |
| 13. | (a) | Develop the transfer function model relating speed and applied voltage of a separately excited DC motor. Make use of Block diagram representation of the motor . | | | | | | | | CO3-App | (16) | |
|  |  | Or | | | | | | | |  |  | |
|  | (b) | Derive the expression of ‘ State equation’ of DC machines | | | | | | | | CO3-App | (16) | |
|  |  |  | | | | | | | |  |  | |
| 14. | (a) | Explain the Park’s equations in detail for synchronous machine. | | | | | | | | CO4 -U | (16) | |
|  |  | Or | | | | | | | |  |  | |
|  | (b) | Explain the Park’s equations in detail for synchronous machine. | | | | | | | | CO4 -U | (16) | |
| 15. | (a) | Explain the analysis of steady state operation of induction machines. | | | | | | | | C05-U | (16) | |
|  |  | Or | | | | | | | |  |  | |
|  | (b) | Explain Free acceleration characteristics | | | | | | | | CO5-U | (16) | |