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**Question Paper Code: 52151**

M.E. DEGREE EXAMINATION, DECEMBER 2015

First Semester

Power Electronics and Drives

15PPE101 - ANALYSIS OF ELECTRICAL MACHINES

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Which of the following material has the highest permeability?  
(a) Nickel                      (b) Cobalt                      (c) Pure iron                      (d) Permalloy
- The energy storing capacity of magnetic field is about \_\_\_\_\_ times greater than that of electric field?  
(a) 50,000                      (b) 25,000                      (c) 10,000                      (d) 40,000
- The frequency of rotor currents at standstill is equal to  
(a) Zero                      (b)  $2f$                       (c)  $f$                       (d)  $sf$
- Find the motor which is used for rolling mills  
(a) DC shunt motor                      (b) DC series motor  
(c) DC differentially compound motor                      (d) DC cumulatively compound motor
- Inter poles in DC machines are provided to reduce  
(a) Sparking                      (b) Armature Reaction                      (c) Iron loss                      (d) Efficiency
- Which loss occurs in the yoke of a DC machine?  
(a) Iron loss                      (b) Copper loss                      (c) Heat loss                      (d) No loss

7. Skewing in the slots of an induction motor is provided to reduce  
 (a) Iron loss                    (b) Noise                    (c) Harmonics                    (d) Temperature rise
8. The losses occurring in the rotor of an induction motor are less than those in the stator because of  
 (a) Small diameter of rotor                    (b) Less rotor frequency  
 (c) Slot skewing                    (d) Both ( a) and ( c)
9. A hunting sound is produced in a synchronous motor when  
 (a) Load fluctuates                    (b) Supply frequency  
 (c) Both (a) and (b)                    (d) None of the above
10. The frame of an induction motor is made of  
 (a) Closed grained cast iron                    (b) Silicon steel  
 (c) Stainless steel                    (d) Aluminium

PART - B (5 x 2 = 10 Marks)

11. Compare single and double excited system
12. List out the variables observed from several frames of reference.
13. Write the general torque equation of a DC machine.
14. What do you meant by steady state operation of a induction machine?
15. Define transient stability limit.

PART - C (5 x 16 = 80 Marks)

16. (a) Derive the general expression of stored magnetic energy, co-energy and force for doubly excited system. (16)

Or

- (b) Explain the  $\lambda$ - $i$  characteristics of magnetic system. Also derive the expression of co-energy density. Assume the  $\lambda$ - $i$  relationship of the magnetic circuit is linear. (16)
17. (a) Explain the transformation of a balanced set using a suitable diagram. (16)

Or

- (b) Derive the basic expression for static and rotating reference frames. (16)

18. (a) Deduce the voltage equation of a DC machine and explain the dynamic characteristics of permanent magnet DC motor. (16)

Or

- (b) Describe in detail the solution methodology of obtaining the dynamic characteristics by Laplace transformation. (16)
19. (a) Explain the simulation of a symmetrical three phase induction motor in the arbitrary reference frame. (16)

Or

- (b) Discuss in detail the transformation for rotor circuits for induction machines and also explain the voltage and torque equation in reference frame variables. (16)
20. (a) Discuss the significance of voltage and torque equation in synchronous machines. (16)

Or

- (b) (i) Explain critical clearing time. (8)
- (ii) Derive voltage equation in arbitrary reference frame for synchronous machines. (8)
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