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**

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| **Code :** | **14EE2009** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ELECTRICAL MACHINE DESIGN** | **Max. marks :** | **100** |

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

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | What are the factors influencing the choice of specific electric loading in electrical machines? | CO1 | 10 |
| b. | A 350 kW, 500 V, 450 rpm, 6 pole dc generator is built with an armature diameter of 0.87 m, and Core length of 0.32m, the lap wound armature has 660 conductors. Calculate specific electric and magnetic loading. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Obtain the relationship between real and apparent flux density in the slots of rotating machine. | CO1 | 10 |
| b. | A 15 kW, 230 V, 4 pole DC machine has the following data: Armature diameter = 0.25 m, armature core length = 0.125 m, length of air gap at pole centre = 2.5 mm, flux per pole = 11.7 x 10-3 Wb, pole arc/pole pitch = 0.66, calculate the mmf required for air gap (i) if the armature surface is treated as smooth (ii) if the armature is slotted and the gap contraction factor is 1.18 | CO1 | 10 |
| 3. | a. | What are the advantages of having more no. of poles in a DC machine? | CO2 | 5 |
| b. | Calculate the size of the conductor and number of turns for the field coil of a 6 pole, 460V, dc shunt motor. The coil is to supply an mmf of 4000AT at working temperature. The length of inside turn is 0.74m. The length available for winding is 0.13m. Stacking factor is 0.52. The permissible dissipation from external surface excluding the ends is 1200 W/m2. Resistivity is 0.02Ω mm2/m. Keep 15% of applied voltage as reserve for speed control. Solution should not be attempted by assuming value for winding depth. | CO2 | 15 |
| (OR) | | | | |
| 4. | a. | Derive the expression for the power developed in DC machine in terms of its main dimensions. | CO2 | 10 |
| b. | Determine suitable values for the number of poles, Diameter, core length of a dc motor with following data. 20HP, 1000 rpm, 400V, specific magnetic loading 0.37 Tesla and specific electric loading 16000 ac/m, efficiency 90%, assume square pole face. | CO2 | 10 |
| 5. | a. | Derive the expression for the number of cooling tubes required for the transformer. | CO3 | 10 |
| b. | Derive the output equation of single phase Transformer and three phase transformer. | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | Determine the main dimensions of the core, the number of turns and the cross – section of the conductors for a 5kVA, 11000/400 V, 50Hz, single phase core type distribution transformer. The net conductor area in the window is 0.6 times the net cross section of iron in the core. Assume a square cross-section for the core, a flux density 1 Wb/ m2 , a current density 1.4 A/ mm2 , and a window space factor 0.2. The height of window is 3 times its width. | CO3 | 16 |
|  | b. | Compare core type and Shell type transformer. | CO3 | 4 |
| 7. |  | Design a cage rotor for a 40 HP, 3-phase, 400V, 50Hz, 6 pole, delta connected induction motor having a full load efficiency of 87% and a full load pf of 0.85 .Take D =33 cm and L=17 cm. Stator slots =54, conductors/slot= 14. Assume suitably any missing data if any**.** | CO2 | 20 |
| (OR) | | | | |
| 8. |  | Determine the main dimensions, number of radial ventilating ducts, number of stator slots and turns per phase of a 3.7 kW, three phase, 400 V, 4 Pole, 50 Hz squirrel cage Induction Motor to be started by a Star-Delta starter. Given that the average flux density in the air gap = 0.45 Wb/m2; Ampere Conductor per meter of armature periphery = 23000, full [load efficiency](http://2freshesworld.com/anna-univ-design-of-electrical-machines-model-question-paper/) = 0.85, full load [power factor](http://2freshesworld.com/anna-univ-design-of-electrical-machines-model-question-paper/) = 0.84 and kw = 0.955. Take L/τ = 1.5. | CO2 | 20 |
|  | | **Compulsory:** |  |  |
| 9. |  | Calculate the output co-efficient for a 1500 kVA, 2200 V, 3 phase, 10 pole, 50 Hz, star connected alternator with sinusoidal flux distribution. The winding has 60º phase spread, full pitch coils, ac = 30000 ac/m and Bav = 0.6 Wb/m2. If the peripheral speed of the rotor must not exceed 100 m/s and the ratio of pole pitch to core length is to be between 0.6 and 1, find D and L. Assume an air gap length of 6 mm. Find also the approximate number of stator conductors. | CO2 | 20 |

ALL THE BEST