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. | Derive the Output equation of a DC machine. | CO1 | 10 |
| b. | Calculate specific electric and magnetic loading of a 100 HP, 3000V, 3φ, 50Hz,8pole,star connected, flame proof induction motor having stator core length 0.5m, stator bore is 0.66m.Take turns/phase=286. Assume full load efficiency=0.938, power factor=0.86. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Calculate the apparent flux density at a section of the teeth of an armature of a DC machine from the following data at that section: slot pitch = 24 mm, slot width = tooth width = 12 mm, length of armature core including 5 ducts of 10 mm each = 0.38, iron stacking factor = 0.92. True flux density in teeth at that section is 2.2 Wb/m2 for which the mmf is 70000 AT/m. | CO1 | 10 |
| b. | A 15 kW, 250V, 4 pole dc machine has the following data: armature diameter = 0.25m, armature case length = 0.125m, length of air gap at pole centre = 2.5mm, flux per pole is 11.7mWb, ratio of pole arc to pole pitch is 0.66. Calculate mmf required for air gap if the armature surface is smooth and gap contraction factor is 1.18. | CO1 | 10 |
| 3. |  | Find the main dimension, number of poles and armature winding of a 100kW, 230V, 1000rpm shunt motor so that a square pole face is obtained. The average gap density is 0.85wb/m2 and ampere conductors per metre are 22000 AT. The ratio of pole arc to pole pitch = 0.67. The full load efficiency is 91%. | CO2 | 20 |
| (OR) | | | | |
| 4. |  | A shunt field coil has to develop an mmf of 9000 AT. The voltage drop in the coil is 40V, resistivity of the round wire is 0.021 Ω / m – mm2. The depth of winding is 35mm and length of mean turn is 1.4m. Design a coil so that the power dissipated is 700 W/m2 of the total coil surface. Take diameter of the insulated wire 0.2 mm greater than that of Bare wire. | CO2 | 20 |
| 5. |  | Calculate the main dimensions of core of 100 kVA, 2000/400 Volts, 50 Hz, single phase shell type transformer. Voltage per turn = 10 volts. Peak flux density in the core is 1.1 Wb/ m2. Window space factor is 0.33. Ratio of core depth to width of central limb = 2.5. Ratio of window height to window width = 3.0 current density in the winding is 2 A/mm2, Stacking factor = 0.9. | CO3 | 20 |
| (OR) | | | | |
| 6. |  | A 500 kVA, 6600/400 volts, Single phase core type transformer has a total loss of 6200 watts at full load. The transformer tank is 110cm × 65cm × 155cm. find the suitable arrangements for the cooling tubes to limit the temperature rise to 35oC. Take the diameter of the cooling tubes as 50 mm and average length of the tube as 110cm. | CO3 | 20 |
| 7. |  | Determine the approximate length and diameter of stator core, the number of stator slots and the number of conductors for a 20kW, 400V, three phase, 4 pole, 1200 rpm, delta connected induction motor. The specific magnetic loading is 0.5T, efficiency is 0.82, ac = 26000amp.conductors/m, power factor = 0.8, L/τ = 1. | CO2 | 20 |
| (OR) | | | | |
| 8. |  | A 90 kW, 500V, 50 Hz; three phase, 8 pole slip-ring induction motor has star connected stator accommodating 6 conductor per slot. The number of stator slots = 63. If the slip ring voltage on open circuit is to be about 500 volts, find the number of rotor slots and the number of conductors in each rotor slot. | CO2 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | Compute the main dimensions of a 1000 KVA, 50 Hz, three phase, 375 rpm alternator. The average air gap flux density is 0.55 Wb/m2 and ampere conductors per metre are 28000. Use rectangular poles. 'Assume the ratio of arc length to pole pitch equal to 2. Maximum permissible peripheral speed is 50 m/sec. The runaway speed is 1.8 times the synchronous speed. | CO2 | 20 |

ALL THE BEST