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



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18EE2006** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ELECTRICAL MACHINES I** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | |
| 1. | State Biot Savart law. | CO1 | 1 |
| 2. | Define MMF. | CO1 | 1 |
| 3. | Give an example of a singly-excited system. | CO2 | 1 |
| 4. | List different methods of excitation of DC generator. | CO3 | 1 |
| 5. | Name the type of DC armature winding requires equalizer rings. | CO3 | 1 |
| 6. | Why is commutator employed in DC machines? | CO3 | 1 |
| 7. | Identify the type of DC generator suitable for electric welding. | CO4 | 1 |
| 8. | On what operating factors does the speed of DC motor depend? | CO4 | 1 |
| 9. | Define voltage regulation of a transformer. | CO5 | 1 |
| 10. | Name the test which is to be conducted on a transformer to estimate its voltage regulation. | CO5 | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Define reluctance and inductance. | CO1 | 3 |
| 12. | Illustrate flux-linkage vs current characteristic of magnetic circuit. | CO2 | 3 |
| 13. | State Fleming’s left hand rule. | CO3 | 3 |
| 14. | DC series motors should never be started on no-load, why? | CO4 | 3 |
| 15. | Compare and contrast 1-phase core and shell-type transformers. | CO5 | 3 |
| 16. | List out the reasons which neccesitate tap-changing. | CO6 | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is a Compulsory Question)** | | | | |
| 17. |  | Derive the expression for force developed in a singly excited system assuming constant voltage system. | CO1 | 12 |
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| 18. | a. | Describe with neat sketches, the main parts of a DC machine. | CO2 | 6 |
| b. | Formulate an expression for the emf generated in the DC machine. | CO2 | 6 |
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| 19. |  | Explain armature reaction in a DC machine. Explain how the effect of armature reaction can be measured. | CO3 | 12 |
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| 20. | a. | Derive the torque equation of a DC motor. | CO4 | 6 |
| b. | A 400V DC shunt motor takes 5A on no-load at its rated speed. The armature resistance including that of brushes is 0.2Ω and the normal field current is 2A. Determine the efficiency of the machine as a generator delivering load current of 30A. | CO4 | 6 |
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| 21. |  | A 20kVA, 440V/220V 1-phase transformer has resistances 0.09Ω and 0.022Ω. The values of the reactances are 0.15Ω and 0.037Ω. Calculate for the transformer (i) total resistance referred to the primary  (ii) total resistance referred to the secondary  (iii) total reactance to the primary  (iv) total reactance to the secondary and  (v) full-load copper loss. | CO5 | 12 |
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| 22. |  | A 75kW, 500V DC shunt motor has 4 poles and wave connected armature winding with 492 conductors. The flux pole is 0.04Wb and full-load efficiency is 91%. The armature and commutating pole windings have a total resistance of 0.08Ω and the shunt field resistance is 200Ω. Calculate for full-load.   1. Speed. 2. useful torque delivered to the load. 3. the torque developed. | CO4 | 12 |
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| 23. |  | Develop the equivalent circuit of a 1-phase transformer and show how it is useful in the analysis of the performance of a transformer. Also, illustrate the phasor diagram showing a leading power factor. | CO5 | 12 |
|  |  | **Compulsory:** | | |
| 24. | a. | Discuss various types of 3-phase transformer connections. | CO6 | 6 |
| b. | Describe with the help of a neat diagram, the parallel operations of an IQ transformer. | CO5 | 6 |