**18EE403**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **July, 2021** | **Electrical and Electronics Engineering** | | |
| **Fourth Semester** | **ELECTRICAL MACHINES – II** | | |
| **Time:** Three Hours | | **Maximum: 5**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X10=40 Marks) |

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| 1. | a) | Draw the torque – speed characteristics of polyphase induction motor? | CO1 | |  |
|  | b) | Define slip. | CO1 | |  |
|  | c) | Define cogging. | CO2 | |  |
|  | d) | State some of the important applications of shaded pole motors. | CO2 | |  |
|  | e) | List the methods to make single phase induction motors self-starting. | CO2 | |  |
|  | f) | why air gap is non-uniform in a salient pole machine. | CO1 | |  |
|  | g) | what are the advantages of short pitching? | CO3 | |  |
|  | h) | What are different tests conducted to determine regulation by ZPF method. | CO3 | |  |
|  | i) | Distinguish between synchronous condenser and synchronous phase modifier. | CO4 | |  |
|  | j) | Elaborate the reason for synchronous motor being non-self-starting. | CO4 | |  |
| **Unit - I** | | | | | |
| 2. | a) | Develop an expression for torque of an induction motor and obtain the condition for maximum torque. | CO1 | **5M** | |
|  | b) | In a 4 pole, 3- phase, 50Hz induction motor with star connected rotor, the rotor resistance per phase is 0.5 ohm, the reactance at standstill is 1.0 ohm per phase and an emf between the slip rings on open circuit is 175V. Calculate i) slip at a speed of 950 rpm, ii) rotor emf per phase. | CO1 | **5M** | |
|  |  | **(OR)** |  |  | |
| 3. | a) | Explain briefly the different methods of speed control of 3 phase induction motor | CO1 | **5M** | |
|  | b) | A 3-phase, 400 V induction motor gave the following test readings:  No-load test: 400 V, 1250 W, 9 A.  Short-circuit test: 150 V, 4 kW, 38 A.  Draw the circle diagram. If the normal rating is 14.91 kW, find from the circle diagram, the full-load values of current and p.f. | CO1 | **5M** | |
| **Unit - II** | | | | | |
| 4. | a) | Explain why a single-phase induction motor does not self-start. Discuss its operation based on double revolving field theory. | CO2 | **5M** | |
|  | b) | Derive the equivalent circuit parameters of single-phase induction motor using No-load and blocked rotor tests. | CO2 | **5M** | |
|  |  | **(OR)** |  |  | |
| 5. | a) | Explain the construction and working of capacitor start capacitor run single phase induction motor. | CO2 | **5M** | |
|  | b) | Draw the torque-speed characteristics of a single-phase induction motor and explain how it can be obtained | CO2 | **5M** | |
| **Unit - III** | | | | | |
| 6. | a) | Explain how Xd and Xq of a salient pole alternator can be found experimentally. | CO3 | **5M** | |
|  | b) | A 3-phase, star connected, 8 pole, 750 rpm alternator has 72 slots on its periphery. Each slot has 12conductors and the winding is short pitched by 2 slots. Find the pitch factor and distribution factor. Also, calculate the induced emf between lines if the flux of 0.04wb is distributed sinusoidally. All the conductors in phase are connected in series. | CO3 | **5M** | |
| **(OR)**  **P.T.O.**  **18EE403** | | | | | |
| 7. | a) | What is meant by synchronization? Explain the way of synchronizing an alternator to the infinite bus bars | CO3 | **5M** | |
|  | b) | |  | | --- | | Explain the effect of armature reaction on the terminal voltage of an alternator | | CO3 | **5M** | |
| **Unit - IV** | | | | | |
| 8. | a) | Discuss about any one starting technique of a synchronous motor. | CO4 | **5M** | |
|  | b) | A 3-phase synchronous motor absorbing 60kW is connected in parallel with a factory load of 240kW having a lagging power factor of 0.8. If the combined load has a p.f of 0.9, find the leading kVAR supplied by the motor and the corresponding p.f. | CO4 | **5M** | |
|  |  | Or |  |  | |
| 9. | a) | What are the effects of hunting on the performance of synchronous motor and explain the method of suppressing the hunting. | CO4 | **5M** | |
|  | b) | A 3 phase , 8 pole 3000V, 50Hz star connected synchronous motor has armature resistance of 0.5ohm per phase and synchronous reactance of 5ohm per phase. While running on no load, the excitation has been excited so as to make the emf numerically equal to and anti-phase with terminal voltage. With a certain load torque applied if the rotor gets retarded by 3 mechanical degrees. Calculate the armature current and power factor of the motor? | CO4 | **5M** | |

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | |
| **July, 2021** | **Electrical and Electronics Engineering** |
| **Fourth Semester** | **Scheme for ELECTRICAL MACHINES – II** |

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| 1 |  | Torque – speed characteristics diagram | 1m |
|  |  | Definition of slip | 1m |
|  |  | Definition cogging | 1m |
|  |  | Any two applications | 1m |
|  |  | Any one method | 1m |
|  |  | Explanation about of non-uniform air gap like projected poles | 1m |
|  |  | Any two advantages | 1m |
|  |  | O.C and S. C and zpf loading test | 1m |
|  |  | Any two similarities or dissimilarities. | 1m |
|  |  | Explanation about why not self-starting | 1m |
| 2 |  | Derivation of torque  Derivation of condition for maximum torque. | 3m  2m |
|  | b) | Calculation of i) slip at a speed of 950 rpm  ii) rotor emf per phase. | 2m  3m |
| 3 | a) | Methods of speed control of 3 phase induction motor  Diagram of any one method  Explanation of any one method | 1m  2m  2m |
|  | b) | Drawing of circle diagram  Determination of current  Determination of p.f. | 3m  1m  1m |
| 4 | a) | Explanation about not self-starting  Diagrams for double revolving field theory  Explanation of double revolving field theory | 2m  1m  2m |
|  | b) | No-load test diagram and explanation  Blocked rotor test diagram and explanation  Equivalent circuit diagram | 2m  2m  1m |
| 5 | a) | Diagram  Explanation  Phasor diagram | 2m  2m  1m |
|  | b) | Diagram  Explanation | 2m  3m |
| 6 | a) | Diagram  Explanation  Oscillograph output diagram | 2m  2m  1m |
|  | b) | Determination of pitch factor  Determination of distribution factor  Determination of conductors and turns  Determination of emf | 1m  1m  1m  2m |
| 7 | a) | Explanation of synchronization  Methods of synchronization  Diagram and explanation of any one method | 1m  1m  3m |
|  | b) | |  | | --- | | Definition of armature reaction\  Phasor diagram under different pf |   Explanation | 1m  2m  2m |
| 8 | a) | Diagram  Explanation | 2m  3m |
|  | b) | Calculation of leading kVAR  Calculation of pf | 3m  2m |
| 9 | a) | Effects of hunting  Methods of supressing hunting explanation | 3m  2m |
|  | b) | Calculation of the ratio of Id and Iq  Phasor diagram of salient pole synchronous motor  Determination of ratio of xd and xq  Condition for maximum torque  Final expression | 1m  1m  1m  1m  1m |