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



**End Semester Examination – Nov/Dec– 2017**

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| **Code :** | **14EE2007** | **Duration :** | **3hrs** |
| **Sub. Name :** | **INDUCTION AND SYNCHRONOUS MACHINES** | **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. | Tests on a 440 V, 50 Hz, 3ϕ, 4-pole, Y – connected induction motor shows that on no load, the motor took 22 A at a p.f. of 0.2 lagging, while at standstill the current was 135A at 0.4 p.f. lagging with the applied voltage reduced to 200 V. Draw the circle diagram and hence determine the maximum power output, maximum torque and the starting torque on normal voltage. | CO1 | 16 |
| b. | When the applied rated voltage per phase is reduced to one-half, what will be the starting torque of a squirrel cage induction motor in terms of its starting torque with full voltage? | CO1 | 4 |
| (OR) | | | | |
| 2. | a. | Explain how to construct a circle diagram from the no-load test and blocked rotor test on an induction motor and how the stator line current, pf, slip and output power are calculated from the circle diagram. | CO1 | 16 |
|  | b. | Sketch the torque slip characteristics and explain it shortly. | CO1 | 4 |
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| 3. | a. | ‘A single phase induction motor is not self starting’- prove this statement using double field revolving theory with mathematical expressions. | CO1 | 15 |
|  | b. | Predict the type of single phase induction motor would you use for ceiling fan and wet grinder with reasons. | CO1 | 5 |
| (OR) | | | | |
| 4. | a. | Find the mechanical power output at a slip of 0.05 of the 180 W, 4 pole 110 V,50Hz, single phase rotating transformer whose constant are as follows R1=1.86Ω, X1=2.56 Ω, R2=3.56 Ω, X2=2.56 Ω, Xm=53.5 Ω, core loss=35 W, friction and wintage losses=13.5 W | CO1 | 16 |
|  | b. | A 3ϕ, 50 Hz, induction motor has 2 poles. If the slip is 2% at a certain load, determine the speed of the rotor. | CO1 | 4 |
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| 5 | a. | Elaborate the principle of operation, construction and applications of stepper motor. | CO2 | 15 |
|  | b. | Interpret the ability of universal motor working in AC and DC power supply. | CO2 | 5 |
| (OR) | | | | |
| 6. | a. | A three phase star connected alternator is rated at 1800 kVA, 11 kV. The armature effective resistance & synchronous reactance are 1.4 Ω and 28 Ω respectively / phase. Calculate the percentage regulation for load at 1250 kW at 0.8 Power Factor lagging and leading. | CO2 | 15 |
|  | b. | Draw the phasor diagram of alternator when it is giving power to the ideal capacitor load. | CO2 | 5 |
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| 7. | a. | A 1.11 MVA, 2.2 KV, 3 phase star connected alternator gave the following test result during OC and SC tests   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Field current | 10 | 20 | 30 | 40 | 50 | | OCC Voltage(KV) | 0.508 | 0.953 | 1.27 | 1.492 | 1.651 | | SCC Current | 200 | 400 |  |  |  |   The effective resistance of the three phase winding is 0.22 Ω/phase. Estimate the full load voltage regulation at 0.8 pf lagging i. pessimistic method and ii. optimistic method. | CO3 | 20 |
| (OR) | | | | |
| 8. | a. | Show that the starting torque of a synchronous motor is zero. | CO3 | 5 |
|  | b. | Prove that an overexcited synchronous motor can compensate for a lagging pf in power system. | CO3 | 10 |
|  | c. | Compare synchronous motor and induction motor. | CO3 | 5 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Describe the slip test for finding Xd and Xq. | CO3 | 10 |
|  | b. | Draw the phasor diagram of a salient pole generator operating at lagging power factor. | CO3 | 7 |
|  | c. | List the advantages of salient pole machines. | CO3 | 3 |

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