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| **Scheme of Valuation/Answer Key** |
| **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**FOURTH SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2019 |
| **Course Code: EE202** |
| **Course Name: SYNCHRONOUS AND INDUCTION MACHINES (EE)** |
| Max. Marks: 100 |  | Duration: 3 Hours |
| **PART A** |
|  |  | ***Answer all questions, each carries 5 marks.*** | Marks |
| 1 |  | Derivation of  volts ….. 4 marksExpression  and  ….. 1 mark | ( 5) |
| 2 |  | Phasor diagram at Unity pf ….. 2 ½ marksPhasor diagram at leading pf ….. 2 ½ marks | ( 5) |
| 3 |  | Conditions for synchronization (voltage, frequency, phase sequence & phase) (no explanation is required) …. 5 marks | (5) |
| 4 |  | Explanation for synchronous motor not self-starting ….. 5 marks  | (5) |
| 5 |  | Definition of crawling …… 2 marks Methods for elimination …… (Chording, using fractional slot windings, skewing (making non-parallel) either stator or rotor slots, increasing the air gap length,) …… 3 marks | (5) |
| 6 |  | Speed control using V/f control – explanation …. 5 marks | (5) |
| 7 |  | Synchronous induction motor diagram ….. 2 marksExplanation ….. 3 marks | (5) |
| 8 |  | Reason for not self starting ….. 4 marks Torque-slip curve of 1-phase induction motor without any starting method …. 1 mark | (5) |
| **PART B** |
| ***Answer any two full questions, each carries 10 marks.*** |
| 9 | a) | Atleast 4 comparisons of salient-pole & cylindrical rotor …. 4 marks | (4 ) |
|  | b) |   *T =*  …… 2 marks ….. 1 mark …… 1 mark….. 2 marks(or  ….. 1 mark …… 1 mark) | (6) |
| 10 |  | Note: 1-phase, 3-phase star/delta will not affect the answers. Plot OCC ….. 4 marks (Full marks shall be given even if the voltage is divided by √3 considering as 3-phase star)  (from OCC corresponding to Ef = 6600V)……. 1 markA …….. 1 mark (to circulate rated armature current) …… 2 marksEf = 7600V (from OCC corresponding to If = 52A) ……. 1 markVoltage regulation =  ……. 1 mark | ( 10) |
| 11 | a) | Atleast 3 causes of harmonics in alternator (concentrated winding, full pitched, integer slot, airgap irregularity etc) …… 3 marksElimination of harmonics – atleast 3 methods - (distribution, chording, skewing, fractional slot winding, alternator connections) ……. 2 marksDetailing is not required. | (5) |
|  | b) |  ….. 1 mark == ……. 2 marksLine voltage = 11244V …… 1 markVoltage regulation =  …… 1 mark | (5) |
| **PART C** |
| ***Answer any two full questions, each carries 10 marks.*** |
| 12 | a) | Circuit diagram for slip test ….. 2 marksExplanation …. 3 marks | ( 5) |
|  | b) | Circuit diagram …. 2 marks Explanation …. 3 marks | ( 5 ) |
| 13 | a) | Explanation of any one method of synchronous motor …… 4 marks | (4) |
|  | b) |  …… 3 marksPower factor ,  …… 1 markPower input == …… 1 markPower developed = Power input – Armature Cu loss = 669025WTorque developed = …… 1 mark | (6) |
| 14 | a) | Explanation – effect of change of excitation in alternator with phasor diagram ….. 5 marks | (5) |
|  | b) |  ….. 1 markStarting torque, ….. 2 marksSlip at maximum torque,  …… 1 markMaximum torque, …… 1 mark | (5) |
| **PART D** |
| ***Answer any two full questions, each carries 10 marks.*** |
| 15 |  | Draw circle diagram ….. 5 marksLine current OP = 30A ….. 3 marksPower factor at full-load = cos30° = 0.866 ….. 2 marks | ( 10) |
| 16 | a) | Sketch the connections of star-delta start at start & run …… 1 markExplanation …… 2 marks…… 1 mark …….. 1 mark | (5) |
|  | b) | Atleast 3 comparisons (IG less complicated as no brushes/sliprings, separate DC excitation required for SG, IG frequency is regulated by power supply, IG efficiency power, draws large reactive power from supply, operates only at leading power factor) …… 5 marks | (5) |
| 17 | a) | Circuit of split-phase IM with explanation ….. 2 marksCircuit of capacitor-star IM with explanation ….. 2 marksCircuit of capacitor start & run IM with explanation ….. 2 marksCircuit of shaded-pole IM with explanation ….. 2 marks | (8) |
|  | b) | Sketch the equivalent circuit and mark all parameters …. 2 marks | (2)  |
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