BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : V**
BRANCH: EEE **SESSION : MO/18**

SUBJECT: EE5203 ELECTRICAL MACHINES-II

TIME: 3.00 HOURS **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1 A 3-phase induction motor has 36 slots and it consists of double layer sinusoidal distributed winding. The motor runs at 1000 r.p.m. The phase sequence is ABC. [2]
(a) Find pole pitch and slot angle.
(b) Draw winding table for phase- A. [4]
(c) Find pitch factor (K_p,)and distribution factor (K_d) of the winding. [6]

Q.2(a) What is Excitation EMF and synchronous Impedance? [2]
Q.2(b) Explain voltage regulation and ZPF method of voltage regulation in an alternator. [4]
Q.2(c) A 100 kVA, 3000-Volts, 50-Hz, 3-phase star- connected alternator has effective armature resistance of 0.2 ohms. The filed current of 40 A produces short circuit current of 200 A and open circuit e.m.f of 1040 V (line). Calculate full load voltage regulation at 0.8 p.f lagging. [6]

Q.3(a) Define synchronizing power. [2]
Q.3(b) Analyze the effect of change in excitation of a no-loaded grid connected alternator with the help of a phasor diagram. (Steam input kept constant). [4]
Q.3(c) Two single phase alternators operated parallel have induced e.m.fs on open circuit of 230 $<0^0$ V and 230 $<10^0$ V and respective reactances of j2 ohms and j3 ohms. Calculate terminal voltage and currents by each of alternator's to a load impedance of 6 ohms (resistive). [6]

Q.4(a) Highlight applications of a synchronous motor power system. [2]
Q.4(b) What is synchronous condenser? Explain the role of synchronous condenser in p.f improvement. [4]
Q.4(c) A 75-kW, 3-phase start connected, 50-Hz, 440 Volts cylindrical rotor synchronous motor operates at rated condition with 0.8 p.f. leading. The motor efficiency excluding filed and stator losses is 95% and X_s =2.5 Ohms. Calculate mechanical power developed, armature current and back e.m.f developed. [6]

Q.5(a) Elucidate Air Gap Power and Electromagnetic Torque. [2]
Q.5(b) Draw the equivalent diagram of 3-phase induction motor correlate its parameters with parts of machines. [4]
Q.5(c) The power input to a 500 V, 50-Hz, 6-pole, 3-phase induction motor running at 975 r.p.m is 40kW. The stator losses are 1 kW and the friction and the windage losses total are 2 kW. Calculate the rotor copper loss and efficiency. [6]

Q.6(a) Why induction motor is called horse power of industry? [2]
Q.6(b) Describe the best method of starting techniques of 3-phase induction motor. [4]
Q.6(c) Describe the modern method of speed control techniques of 3-phase induction motor. [6]

Q.7(a) What is Double Revolving Field Theory? [2]
Q.7(b) Describe a motor being used in ceiling fan with circuit phasor diagram and torque- speed curve. [4]
Q.7(c) A 250-W, 200- V 50-Hz capacitor start induction motor has the following constants for the main and auxiliary windings. Z_m = 4.5 +j3.5 Ohms, Z_a =9.5+ j3.5 Ohms. Determine the value of starting capacitor that will place for the main and auxiliary winding currents are in quadrature at starting. [6]

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