BITS, Pilani- Dubai Campus
Knowledge Village, Dubai
First Semester 2005-2006
III Year EIE

INSTR UC371- Electromechanical Energy Conversion

Second -Test (Open Book) Make up

Time 50 Minutes **Maximum Marks 20**

Answer all Questions

Q1 A 240 V series motor takes 40 A when giving its rated output at 1500 rpm. Its resistance is 0.3 ohms. Find what resistance must be added to obtain rated torque at start and at 1000rpm. **6 Marks**

Q2 A 400 V shunt motor draws 30 A while supplying the rated load at a speed of 100 rad/sec. The armature resistance is 1 ohm and the field winding resistance is 200ohm. Determine the external resistance that must be inserted in series with the armature circuit so that the armature current does not exceed 150% of its rated value when the motor is plugged. Determine the braking torque at the instant of plugging and when the motor is approaching zero speed. **8 Marks**

Q3 Is it feasible to wind an ac generator using full pitch winding ? What are its advantages and disadvantages? In designing automatic starters and control equipment, the armature circuit is usually selected for reversal, why? **(3+3) Marks**

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BITS, Pilani-Dubai Campus
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III Year EIE, Semester I, 2005-2006

Comprehensive Exams

INSTRU UC371 (Electromechanical Energy Conversion)

Max Marks 60 **Time 3 Hours**

Answer all five Questions. Each question carries equal marks.

Q1 a) Derive a relation for two transformers connected in parallel having unequal voltage ratio. 4 marks

b) A 3 phase step down transformer takes 15A when connected to 4400 V mains. The turn ratio per phase is 10. Neglecting losses find the secondary line voltage, line current and output if the transformer windings are connected star/ delta. 3 marks

c) Explain with the help of connection and vector diagrams how a 2 phase supply can be obtained from a three phase supply. 5 marks

Q2 a) What is a distribution factor? Derive an expression for distribution factor of a winding. Write the advantages of using fractional pitch windings. (1+3+2) marks

b) A 3 phase, 16 pole alternator has the following data:
Number of slots 192, conductors / slots 8, coil span 160 electrical degrees, speed of the alternator 375 rpm, flux / pole =55mwb. Calculate the phase voltage of the alternator. 6 marks

Q3 a) Explain the phenomenon of armature reaction in a D.C Machine. What are the methods of electrical braking of DC Motors? Discuss Plugging. (3+1+2) marks

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INSTR UC371- Electromechanical Energy Conversion

Second -Test (Open Book)

Date of Test 20 November 2005, **Time** 50 Minutes **Maximum Marks** 20

Answer all Questions

Q 1

a) Why all field coils placed on field poles have the same number of turns/pole and are always connected in series.

b) Why all shunt field coils are designed to produce the required MMF using a large number of turns and low current.

c) Distinguish between open and closed armature windings and describe their applications to dc and ac dynamos.

d) Explain why only two brushes are needed on wave windings, regardless of the number of poles.

Marks (3 x 4)

Q2 A 220 V, 1500 rpm, DC motor has a full load armature current of 30 A. It is proposed to design a starter which restricts the maximim amature current during start to 60 A. For design purposes, the minimum current during starting is to be restricted to 30A; the sries resistance in the armature circuit being cut out in steps whenever the current falls to 30A. Assuming that the armature resistance of the DC motor is 0.5 Ohm, calculate the maximum series resistance uses in the starter and the amount of resistance cut out during each of the first two steps.

8 Marks

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First Semester 2005-2006
III Year EIE

INSTR UC371- Electromechanical Energy Conversion

First –Test (Closed Book)

Date of Test 2nd October 2005, **Time** 50 Minutes **Maximum Marks** 20

Answer all Questions

Q1 Three single phase transformers are connected in Delta form. If one transformer is found faulty and removed what will be the reduction in rating of each of the other transformers? What must be rating of each transformer in a V-V connection to supply a 3 phase balanced load of 200 kVA? If a third similar transformer is included what will be the rated capacity of the set? (8)

Q2 Sketch the four possible ways of connecting three single phase transformers as a three phase transformer (4)

Q3 Under what conditions will there be no circulating current when two transformers are operated in parallel at no load?
Two 110 V single phase furnaces take loads of 500 kW and 800 kW respectively at a power factor of 0.71 lagging and are supplied from 6600V, 3 phase mains through a Scott connected transformer combination. Calculate the currents in the 3 phase lines, neglecting transformer losses. (2+6)