RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Faculty of Engineering and Technology			
Department	Electrical engineering	Programme	B.Tech (All branches)
Semester/Batch	1/2017		
Course Code	ESC107A	Course Title	Elements of Electrical Engineering
Course Leader	Mr. S. Nagaraj Rao, Mr. Sachin S. and Mr. Veerabhadra		

Assignment - 02			
Reg. No.		Name of Student	

Sections		Marking Scheme	Marks		
			Max Marks	First Examiner Marks	Moderator
Part-A					
	A1.1	Selection criteria for traction	03		
	A1.2	Characteristics of AC and DC machine for traction system	03		
	A1.3	Discuss about the need of high starting torque in traction system	03		
	A1.4	Conclusion	01		
		Part-A Max Marks	**10**		
Part B.1					
	B1.1	Calculation of Losses	02		
	B1.2	Efficiency and regulation of the transformer at full load	03		
	B1.3	Efficiency and regulation of the transformer at half load	03		
	B1.4	Conclusion	02		
		B.1 Max Marks	**10**		
Part B.2					
	B2.1	Block diagram	02		
	B2.2	Resistance of the leads from the dynamo to the village	03		
	B2.3	Board Of Trade (BOT) units of energy (kwh) consumed in 10 hours in the village	03		
	B2.4	Energy wasted in the leads	02		
		B.2 Max Marks	10		
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	B3.1	Identification of connection & justification	02		
	B3.2	Equivalent circuit diagram	03		
	B3.3	Armature current per parallel path	02		
	B3.4	Flux per pole	03		
		B.3 Max Marks	**10**		
Part B.4					
	B4.1	Secondary currents supplied to given loads	04		
	B4.2	Secondary power factor	02		
	B4.3	Primary current and primary power factor	04		
		B.4 Max Marks	**10**		
	Total Assignment Marks		**50**		

Course Marks Tabulation				
Component- CET B Assignment	**First Examiner**	**Remarks**	**Second Examiner**	**Remarks**
A				
B.1				
B.2				
B.3				
B.4				
Marks (Max 50)				
Marks (out of 25)				

Signature of First Examiner Signature of Second Examiner

Please note:

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner's comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – CET B: Assignment** table.

4. If the variation between the marks awarded by the first examiner and the second examiner lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks then both the examiners should resolve the issue in consultation with the Chairman BoE.

Assignment

Instructions to students:

1. The assignment consists of 5 questions: Part A – 1 Question, Part B- 4 Questions.
2. Maximum marks is 50.
3. The assignment has to be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to**20**.
5. Restrict your report for Part-A to 3 pages only.
6. Restrict your report for Part-B to a maximum of 17 pages.
7. The printed assignment must be submitted to the course leader.
8. **Submission Date: 20th November 2017**
9. **Submission after the due date is not permitted.**
10. **IMPORTANT**: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
11. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

Course Preamble

This course deals with basic principles and concepts of Elements of Electrical Engineering. Students are taught the fundamentals of circuit analysis, magnetic circuits, transformers and AC machine operation, fractional-kW motors and DC machines, measuring instruments, wiring and earthing techniques. In addition, wiring methods based on the type of electrical machine used for a given application will be taught using standard software tools.

PART A **(10 Marks)**

Preamble

Rotating machines are commonly used in industrial drive systems. It can be energized by AC and DC power supplies, which works on the principle of electromechanical energy conversion. These rotating machines finds wide application in manufacturing industries, traction system etc.

Debate on the topic

"AC machines are preferred over DC machines for traction system"

Your debate should address the following:

A1.1 Selection criteria of electrical machines for traction system

A1.2 Critical review of the characteristics of AC and DC machines for traction system

A1.3 The need of high starting torque for traction system

A1.4 Justification of your stance and conclusion

PART B **(40 Marks)**

B1 **(10 Marks)**

A university campus is erected with a single phase 400 kVA core type transformer for meeting power requirements. Name plate details of the transformer are listed below:

- Primary winding resistance and reactance are 0.5 Ω and 2 Ω respectively
- Secondary winding resistance and reactance are 0.001 Ω and 0.05 Ω respectively
- Primary and secondary voltages are 11 kV and 440 V respectively
- Power factor of the load is 0.85

i) Determine the efficiency and regulation of the transformer on full load and half load for Case 1 and Case 2.

Case 1:

Assume iron loss of the transformer as 2.5 kW

Case 2:

Area of the core is 1800 cm^2, 200 turns, K_h= 0.80, K_e = 0.60

ii) Comment on the results

B2 **(10 Marks)**

The lighting load of a small village is 15 A at 220 V, supplied from a dynamo of a distant station. If the generated voltage is 230 V.

Compute:

B2.1 Draw the block diagram of given system

B2.2 Resistance of the leads from the dynamo to the village

B2.3 The number of Board Of Trade (BOT) units of energy consumed in 10 hours

B2.4 Energy wasted in the leads for the same duration

B3 **(10 Marks)**

Consider a 4-pole lap connected DC machine that converts mechanical energy into electrical energy and is used for constant voltage applications. The DC machine has an armature resistance of 1 Ω and a field resistance of 300 Ω. The armature has 120 conductors in the slots and runs at 1000 rpm. Machine is required to supply the following loads at 250 V:

(i) 3 kW Geyser

(ii) 2 kW Lighting load

(iii) 5 kW Submersible pump

(iv) 2.5 kW Electric oven

Note: Allow 1V drop per brush

Perform the following:

B3.1 Identify whether the loads should be connected in parallel or series and justify your choice.

B3.2 Draw the equivalent circuit.

Calculate:

B3.3 Armature current per parallel path

B3.4 Magnetic flux per pole

B4. **(10 Marks)**

A small substation has a single phase 6.6 kV/240 V transformer supplying the following loads:

(i) 10 kW at 0.5 pf lag

(ii) 3 kVA at 0.707 pf lag

(iii) 5 kW at unity pf

(iv) 8 kVA at 0.6 pf lag

Neglecting losses in the transformer, calculate the following:

B4.1 Secondary current drawn by each of the loads

B4.2 Secondary power factor

B4.3 Primary current and primary power factor