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|  | | **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-01** | | | | | |
| Reg. No. |  | | ALOK KR SINGH | |  | |

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| Sections |  | Marking Scheme | | | |  | | Marks | |
| Max Marks | | First  Examiner  Marks | Moderator |
| **Part**  **-**  **A** |  |  | | | |  | |  | |
| A1.1 | Discussion of Norton’s and superposition theorems with example | | | | 03 | |  |  |
| A1.2 | Illustration and conditions of Thevenin’s and superposition theorems | | | | 03 | |  |  |
| A1.3 | Suitability of Norton’s/ superposition theorem for power calculation | | | | 03 | |  |  |
| A1.4 | Conclusion | | | | 01 | |  |  |
|  | **Part-A Max Marks** | | | | **10** | |  |  |
| **Part B.1** |  |  | | | |  | |  | |
| B1.1 | Resistance between terminals A and B | | | | 04 | |  |  |
| B1.2 | Value of Rx for maximum power | | | | 02 | |  |  |
| B1.3 | Value of this maximum power | | | | 03 | |  |  |
| B1.4 | Conclusion | | | | 01 | |  |  |
|  | **B.1 Max Marks** | | | | **10** | |  |  |
| **Part B.2** |  |  | | | |  | |  | |
| B2.1 | Values of all the resistors based on its colour codes | | | | 02 | |  |  |
| B2.2 | Equivalent electrical circuits | | | | 03 | |  |  |
| B2.3 | Voltage drop across each resistor | | | | 02 | |  |  |
| B2.4 | Current flowing through each resistor | | | | 02 | |  |  |
| B2.5 | Conclusion | | | | 01 | |  |  |
|  | **B.2 Max Marks** | | | | 10 | |  |  |
| **Part**  **B.3** |  |  | | | |  | |  | |
| B3.1 | Load in kW | | | | 03 | |  |  |
| B3.2 | Maximum possible current | | | | 03 | |  |  |
|  | B3.3 | Daily consumption of energy | | | | 03 | |  |  |
| B3.4 | Electric charges for the month of September | | | | 01 | |  |  |
|  | **B.3 Max Marks** | | | | **10** | |  |  |
| **Part B.4** |  | | | | |  | | | |
| B4.1 | Simulation and graph | | | | 03 | |  |  |
| B4.2 | Mathematical equation | | | | 02 | |  |  |
| B4.3 | Conduction of experiment | | | | 04 | |  |  |
| B4.4 | Comment | | | | 01 | |  |  |
|  | **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 - 2**

**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: 09th October 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**

A network can be modelled in terms of interconnection of elements, components or devices. The network is written in terms of network variables, these network variables are ‘current through the components’ and ‘voltage across the components’. There are two kinds of components in a network i.e., active and passive. An active device supplies energy to the passive device. The active device is a source and the passive device a load.

The interconnection of sources, resistances and other parameters together in a closed loop is called electrical circuit. Various laws and theorems have been developed to analyse these simple and complex electrical networks.

Debate on the topic “**Norton’s theorem is preferred over superposition theorem to solve complex electrical circuits**”

Your debate should address the following:

A1.1 Discuss Norton’s and Superposition theorems with an example each

A1.2 Conditions for applying Norton’s and Superposition theorem

A1.3 Suitability of Norton’s/ superposition theorem for power calculation A1.4 Justify your stance with conclusion

**PART B (40 Marks)**

**B.1** **(10 Marks)**

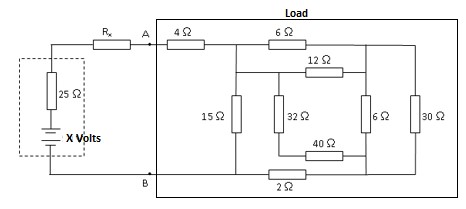
In a car engine, the power delivered to starter motor of the car will depend on effective resistance of the motor, internal resistance of the battery and resistance ‘Rx’. If the resistance values are equal then maximum power will be transferred. Consider a battery of ‘X’ Volts with an internal resistance of 25 Ω, connected to a network as shown in Figure 1.

Compute:

B1.1 Value of the effective resistance between terminals A and B

B1.2 Value of ‘Rx’ for transfer of maximum power

B1.3 Value of the maximum power transferred



# Figure .1

Note: For the value of ‘X’ contact course leader

**Solution of B1-B1.1**

by arranging the given load in simplest form, we get : -

B●

A●

**R1=4Ω**

**R2=6Ω**

**R4=30Ω**

**R6=2Ω**

**R3=12Ω**

**R5=6Ω**

**R8=40Ω**

**R7=32Ω**

**R9=15Ω**

Here R2 and R3 are in parallel, therefore: -  **= 4 Ω**

and R4 and R5 are in parallel so:  **= 5 Ω**

now, (R2||R3) and (R4||R5) are in series, so: **5 Ω + 4 Ω= 9 Ω**  (let their resultant be R’)

since R7 and R8 are in series therefore: - **32+40 = 72 Ω** (let their resistance be R’’)

now, R’ and R’’, both are in parallel so: -  **= 8 Ω**  (let their resultant be R’’’)

since R’’’ and R6 are in series therefore: - **8 + 2 = 10 Ω** = R10

now R10 and R9, both are in parallel so: -  **= 6 Ω**

the resistance R1 and resultant resistance of complete branch are in series so the final resultant of load is – **6 + 4 = 10 Ω**

**B.2** **(10 Marks)**

The colour code of resistors in Figure 2 and Figure 3 are as follows:

R1 = Brown, Green, Red, Gold

R2 = Yellow, Violet, Orange, Silver

R3 = Red, Green, Red, Gold

R4 = White, Black, Red, Silver

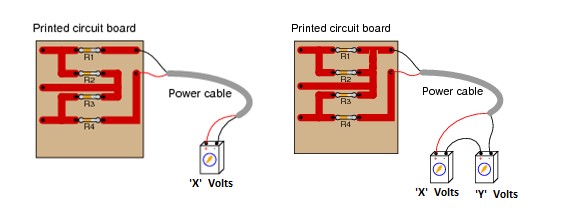


Figure .2 Figure .3

B2.1 Calculate the value of the resistors using colour code.

B2.2 Draw the network configuration for the given circuits shown in figures 2 and 3. B2.3 Calculate the voltage drop across each resistor for the given circuits shown in figures 2 and 3.

B2.4 Calculate the current flowing through each resistor for the given circuits shown in figures 2 and 3.

Note: For the values of ‘X’ and ‘Y’ contact course leader

**B.3** **(10 Marks)**

A building has

* + 15 LED lamps of 16 W each used for 5 hours a day
  + 4 fan points of 75 W each running for 10 hours a day
  + Plug point for a 750 W heater used for 1 hour a day
  + One TV 100 W used for 6 hours a day
  + A 380 W water pump of 80% efficiency running for 2 hours a day

The supply voltage is 230 V and the energy cost is according to your native state electricity board. The rent of energy meter is Rs. 20 per month.

Estimate:

B3.1 Total connected load in kW

B3.2 Maximum current drawn from the supply

B3.3 Daily consumption of energy

B3.4 Electricity bill for the month of September

**B.4 (10 Marks)**

Consider an electrical circuit with voltage source connected in series with a variable resistance ‘R’ ranging from 1 kΩ to 6 kΩ. Simulate the circuit using any software tool. Vary the voltage source VDC from 0 to 10 V, compute Table 1 and answer the following:

# Table 1

|  |  |
| --- | --- |
| VDC (Volts) | IDC (Amps) |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |

B4.1 Plot ‘VDC’ vs ‘IDC’ using Table 1.

B4.2 Analyse the plot of ‘VDC’ vs ‘IDC’ and derive the mathematical equation.

B4.3 Verify the simulation results experimentally.

B4.4 Interpret both simulation and experimental results.

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