BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Environment Water and Coastal Engineering
Student Group : 0 < Earned Credit Hour <= 36, Final Examination (Fall) : Dec 2020

Subject: EECE-167, Basic Electrical Technology

Total: 2.00 hours **Full Marks: 180**
Section A : 1.00 hour **Section A : 90**

INSTRUCTIONS:

a. Use **SEPARATE** answer scripts for each section.
b. **Question – 1 and Question – 4 (Viva Voce)** in **Section A** are compulsory.
c. Answer any **OTHER ONE** question from this section **(From Q-2 & Q-3)**.
d. Figures in the margin indicate full **marks**.
e. Assume reasonable data if necessary.
f. **Symbols** used have their usual meanings.

SECTION-A

Question – 1 (Compulsory)

a. State the maximum Power Transfer Theorem for an electrical circuit. **2**

b. For the circuit in Fig. 1(b) **16**

(i) Find the value of R_L for maximum power to the load.
(ii) Find the value of maximum power to the load.

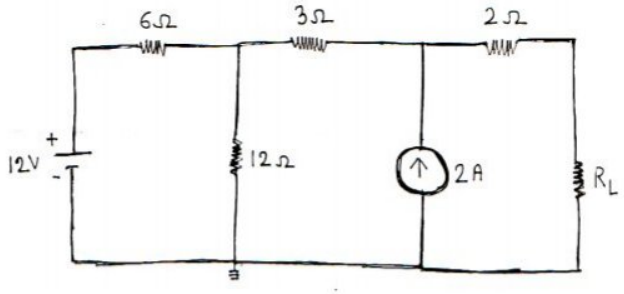


Fig. 1(b)

c. For the circuit in Fig. 1(c) **18**

(i) Find the total resistance R_T
(ii) Find the source current I_S
(iii)Find the currents I_3 and I_9
(iv)Find the voltage V_{ab}.

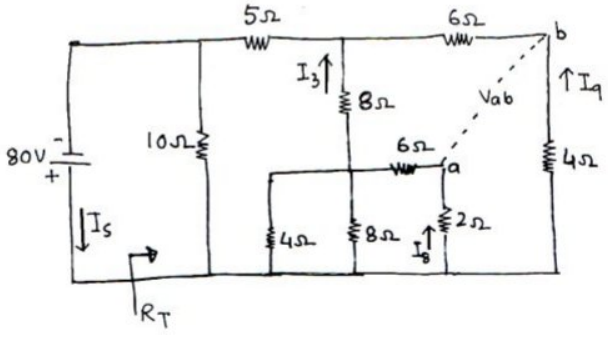


Fig. 1(c)

Question – 2

a. For the circuit in Fig. 2(a) write down the nodal equations and find out the nodal voltages V_1, V_2 and V_3 using nodal analysis. **16**

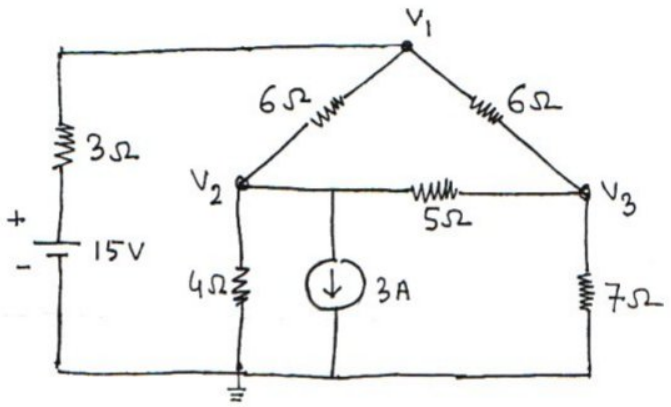


Fig. 2(a)

b. For the circuit in Fig. 2(b) replace the Π configuration (composed of 3 kΩ resistor) with a T configuration and find out the current I_S with the replaced (T configured) circuit. **12**

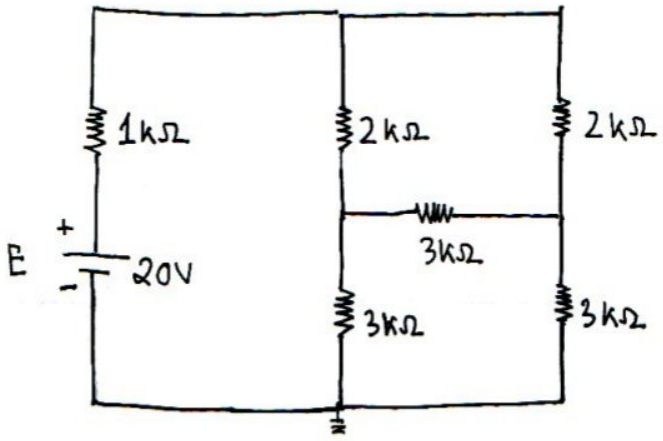


Fig. 2(b)

c. Using superposition, find the current I through resistor R_2. Use the last two figure of your 9-digit Student Roll as the value of R_2. (If your Roll is 202030014 then value of R_2 will be 14 Ω). **8**

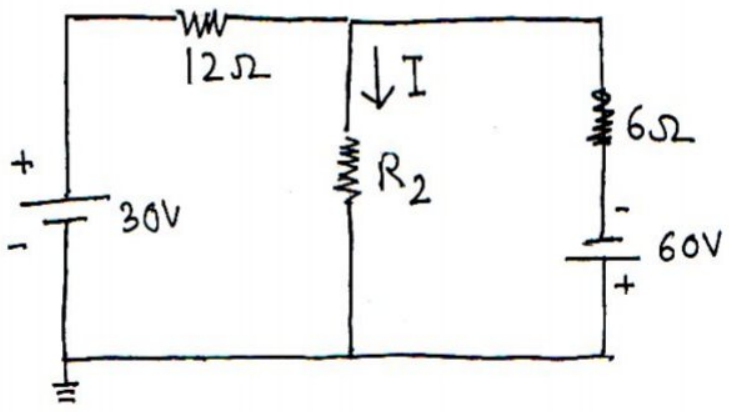


Fig. 2(c)

Question – 3

a. For the circuit in Fig 3(a), find the Thevenin equivalent circuit at terminals a-b. **18**

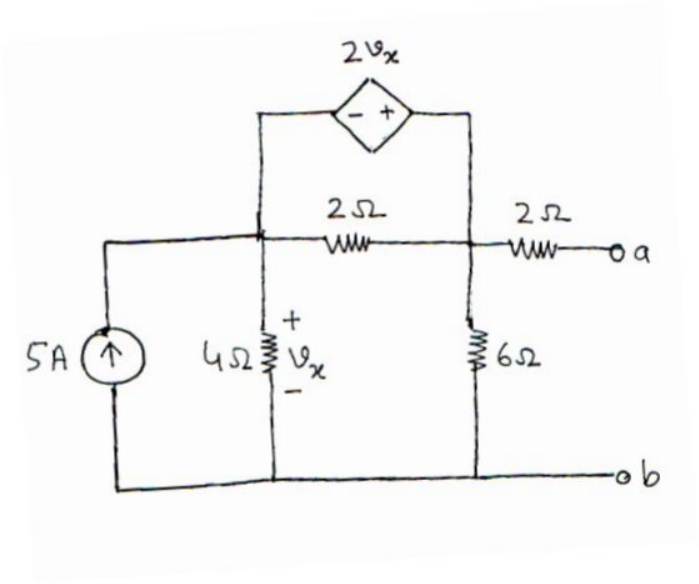


Fig. 3(a)

b. Determine the current I required to establish a flux of 1.5×10^{-4} wb in the core bcde in Fig 3(b) (B-H curve attached). **12**

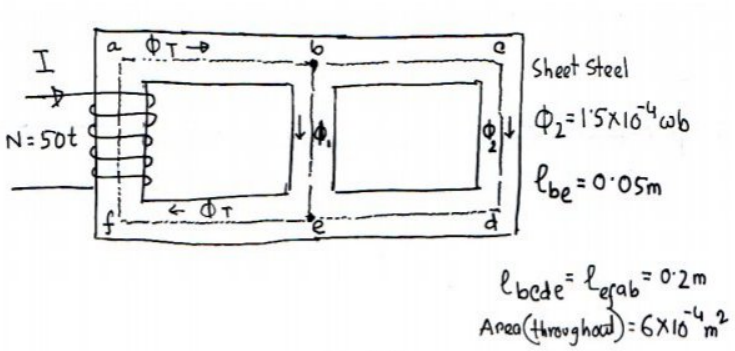


Fig 3(b)

c. For the circuit in Fig. 3(c) **6**

(i) Find the total capacitance
(ii) Determine the change on each plate

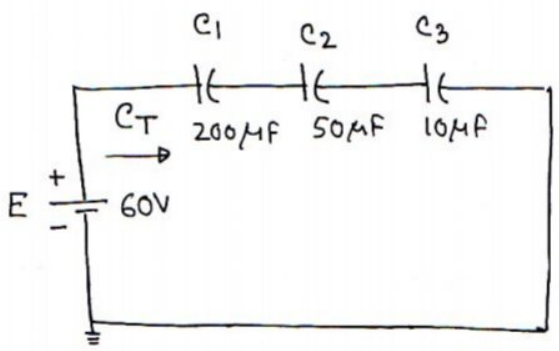
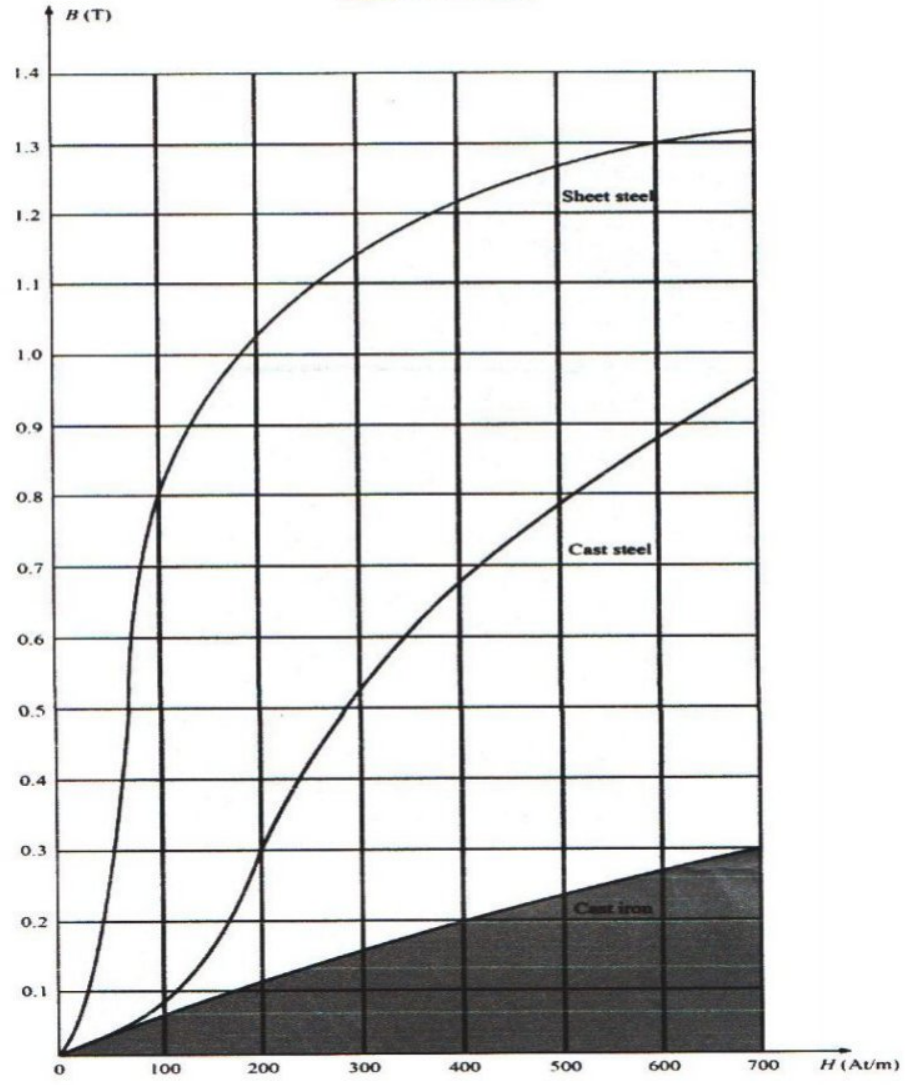
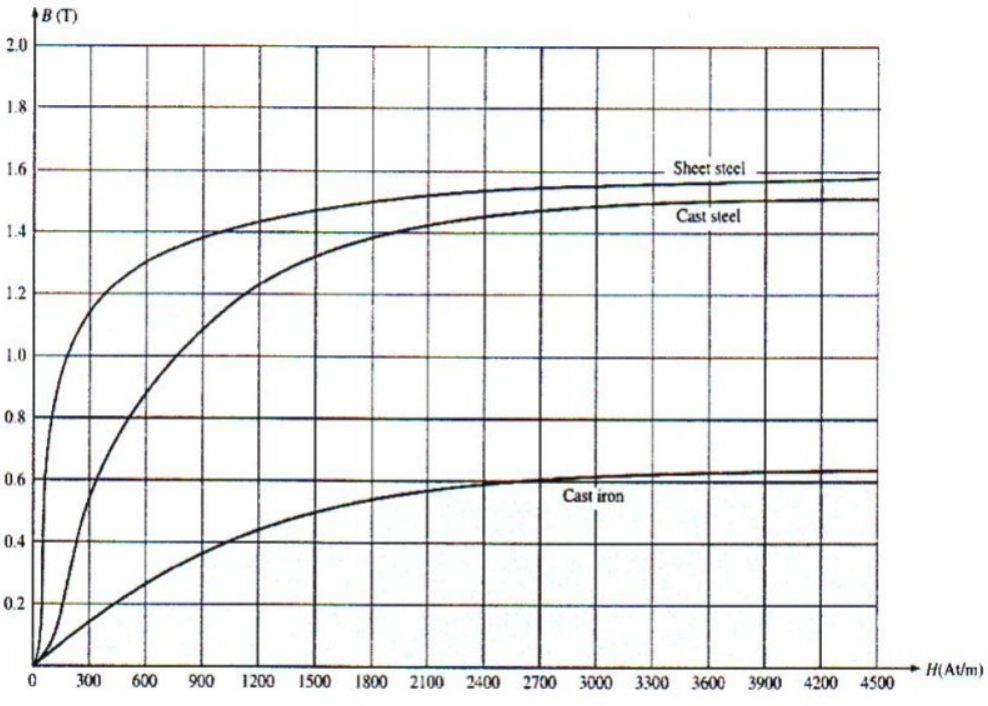


Fig. 3(c)

Question – 4 Viva Voce (Compulsory) **18**

B-H CURVE


B (T)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Sheet steel
Cast steel
Cast iron
0
100
200
300
400
500
600
700
H (At/m)


B (T)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
Sheet steel
Cast steel
Cast iron
0
300
600
900
1200
1500
1800
2100
2400
2700
3000
3300
3600
3900
4200
4500
H(At/m)

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Section B : 1.00 hour **Section B : 90**

INSTRUCTIONS:

a. Use **SEPARATE** answer scripts for each section.
b. **Question – 5 and Question – 8 (Viva Voce)** in **Section B** are compulsory.
c. Answer any **OTHER ONE** question from this section **(From Q - 6 & Q - 7)**.
d. Figures in the margin indicate full **marks**.
e. Assume reasonable data if necessary.
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SECTION-B

Question – 5 (Compulsory)

a. A voltage $v=200\sin 535t$ volts is impressed on a pure capacitance of 670 μF. **12**

(a) Write the expression for i as a function of time.
(b) Illustrate power curve for this case.
(c) Evaluate the maximum amount of energy stored in the capacitance during a cycle.

b. Compute I, V_1, V_2 and V_0 for the given circuit **12**

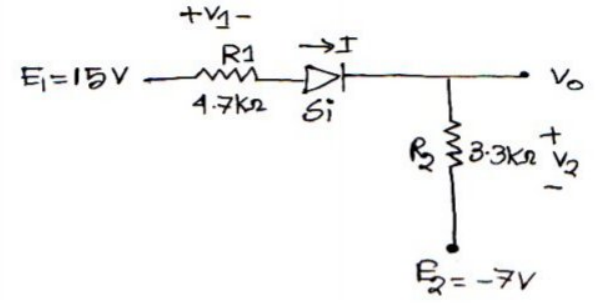


Fig. 5(b)

c. Explain the design rules of standby supply in 11 kV/0.4 kV electrical substation. **12**

Question – 6

a. Under oscillating, alternating and periodic wave, in which class can you categorize the given wave? Find the rms, average value and form factor for that current wave. **12**

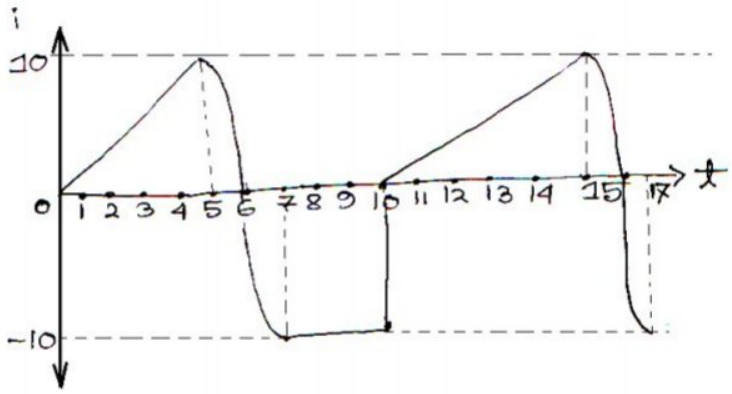


Fig. 6(a)

b. For the circuit arrangement and constants shown in the figure 6(b), evaluate the frequency, power, power factor and voltage drop across each part of the circuit at resonance. Also estimate quality factor and bandwidth. **12**

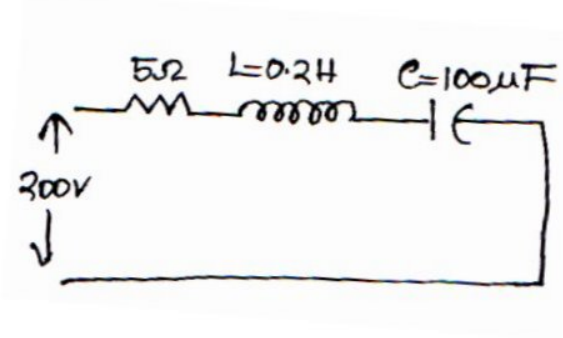


Fig. 6(b)

c. (i) A sinusoidal alternating currents of 10A is flowing through a resistance of 60 Ω. Calculate the average and peak value. **12**

(ii) If $i=-3\cos(\omega t-50)$ and $v=5\sin(\omega t-180)$ predict which of them leads?

Question – 7

a. In the given balanced three phase system, line voltage is 220 volt. Compute the line current, power per phase and total power. **12**

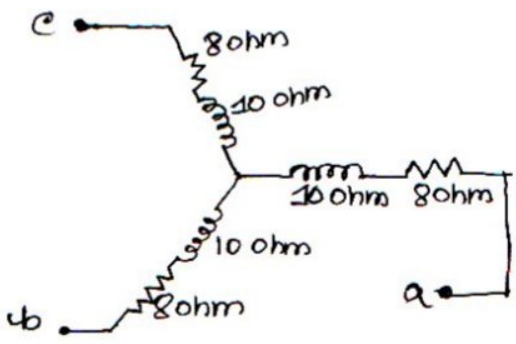


Fig. 7(a)

b. An RLC series branch consists of R=15 ohm, L=0.078 henry and C=65 μF. **12**

(i) What is the vector or complex impedance of the RLC branch at 60 cycles?

(ii) What is the vector current I=20∠60 A flows through the branch find the vector voltage across the terminal of the series branch.

c. Solve the given circuit and find I_1, I_2 and I_{D2} **12**

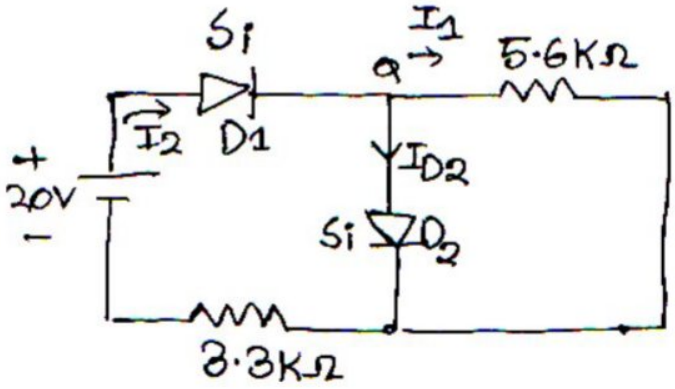


Fig. 7(c)

Question – 8 Viva Voce (Compulsory) **18**