SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
FACULTY OF ENGINEERING AND TECHNOLOGY
CYCLE TEST-III-ANSWER KEY – SET A

Sub. Code/ Name: 18EES101J/ Basic Electrical and Electronics Engineering

PART – A (20 x 1 = 20)

1. Ohm's law can be applied for _____ devices**. (D) Linear**
2. When 'n' number of equal resistance each of R ohms are connected in parallel, then the equivalent resistance R_{eq} is given by **(B) R/n**
3. Does maximum power transfer to a load imply maximum efficiency? **(B) No**
4. In a series R-C circuit, if the true power is 2 W, and reactive power is 1.5 VAR, what is power factor? **(A) 0.8 leading**
5. Relative permeability of vacuum is **(C) 1**
6. Which component converts the alternating current into direct current in a D.C machine **(A) Commutator**
7. The speed of rotation of field in a three phase induction motor is **(B) 120*f/P**
8. Transformer cores are laminated in order to reduce ----------losses. **(A) Eddy current**
9. Which of the following devices can be used with both AC and DC? **(B) Moving iron type**
10. A good earthing should provide _____ resistance in earthing path. **(C) Low**
11. What happens to cut-in voltage in semiconductor diode, when temperature increases? **(B) Cut-in voltage decreases**
12. Which one of the following is not a necessary component in a biased clipper circuit? **(B) Capacitor**
13. Which transducer is known as 'self-generating transducer'? **(A) Active transducer**
14. The emission of light by LED is due to _____ phenomenon.**(D) Electroluminescence**
15. Strain gauge is a **(C) Passive device and converts mechanical displacement into a change of resistance**
16. Photo diodes operate under _____ biased condition. **(B) Reverse**
17. Binary equivalent of hexadecimal number $(A7.5)_{16}$ is _____ **(C) 10100111.0101**
18. $A + \bar{A}$ = _____ **(C) 1**
19. Which one of the following is universal gate **(D) NAND**
20. The process of getting back the message signal from modulated signal is known as **(C) Demodulation**

PART-B (5 x 4 = 20 marks)

21. State KCL and KVL with suitable circuit illustration.

    Definition: 2 mark, Illustration: 2 marks

22. Define Average value of sinusoidal wave form. Find the Average value of voltage $v(t)=150 \sin wt$.

    Definition: 2 mark, Equation : 1 mark, numerical answer: 1 mark

23. What is the purpose of starter in DC motor? Suggest a suitable starter for different types of DC motor.

    Purpose of starter: 3 mark, Name of types of starter: 1 mark

24. Briefly explain the clamper with neat diagram.

    Working: 3 mark, diagram: 1 mark

25. Write short notes on temperature transducers.

    Working: 3 mark, diagram: 1 mark

26. Draw the symbol and truth table of the following log gates (i) 'EX-OR' (ii) 'EX-NOR'

    Diagram: 1 mark, Truth table: 1 mark for each gate

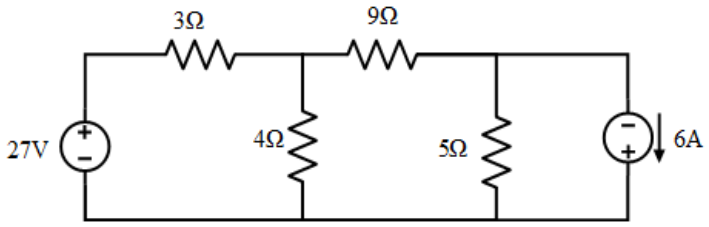
27. Convert $(856.25)_{10}$, $(236.54)_8$ into binary.

    $(856.25)10 = (1101011000.01)_2$ **- 2 marks**

    $(236.54)_8 = (010011110.101100)_2$ **- 2 marks**

PART- C (5x 12=60)

28. (a). i. Calculate the power delivered by 9 Ω resistor for the network shown below using nodal analysis (10)



KCL Equ: 4 marks, V_1, V_2 : 4 marks, Power : 2 marks

$-0.6944\ V_1 + 0.111\ V_2 = -9$;

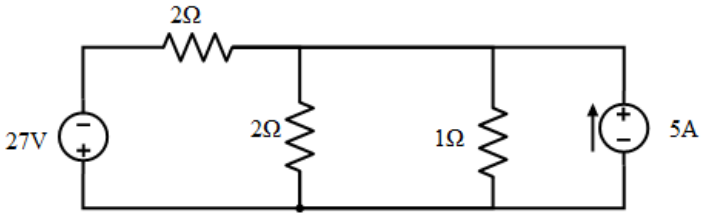
$0.111\ V_1 - 0.3111 V_2 = 6$;

$V_1 = 10.474$ V, $V_2 = -15.546$ V;

Power Dissipated in 9 Ω resistor= 75.226 W

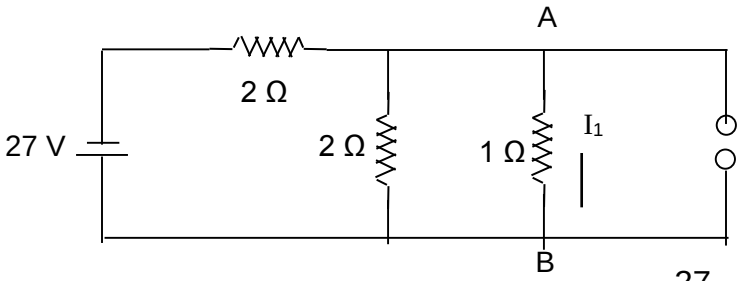
(OR)

28. (b). Calculate the current through the 1 Ω resistor in the circuit shown below using super position theorem



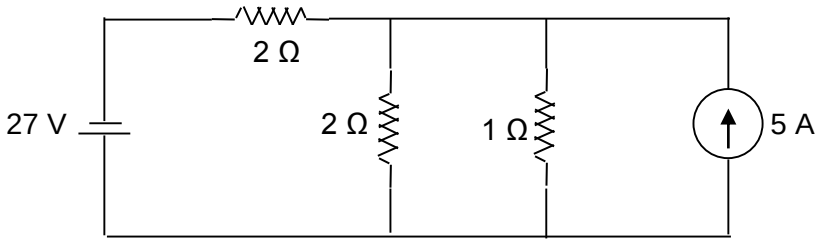
I_1', I_1" : 5 marks, I_1: 2 marks

Solution: First calculate current I_1 due to voltage source alone. The current source is open circuited. The resulting circuit is shown below.



Total circuit resistance $R_T = 2.6667\ \Omega$. Circuit current $I_T = \frac{27}{2.6667} = 10.15$ A

Current $I_1' = \frac{2}{3} \times 10.15 = 6.76$ A from B to A



Now calculate current I_2 due to current source alone. The voltage source is short circuited as shown in Fig.

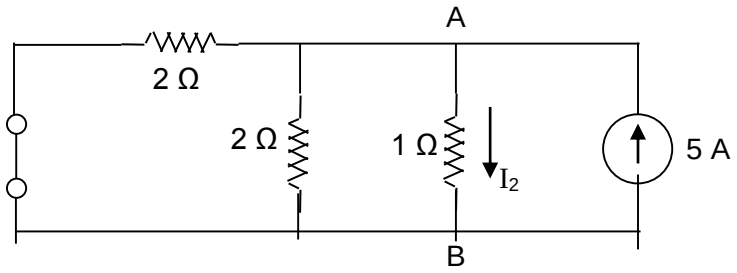


Fig. Circuit - Example 1

Noting that two 2 Ω resistors are in parallel, current I_1'' = 2.5 A from A to B.

When both the sources are simultaneously present:

Current through 1 Ω resistor = 2.5 - 6.76 = - 4.26 A from A to B.

28. (a) An inductive circuit has a resistance of 50 ohm and an inductance of 0.5 H. It is connected across the voltage source of 200 V, 50 Hz. Find (i) Reactance (ii) Impedance (iii) Current (iv) Power factor (v) Voltage across resistance (vi) Voltage across inductance. Also, draw the phasor diagram for all voltages and current.

X_C, Z = each one mark; I, PF, V_L, V_C, phasor diagram = each two marks;

$X_L = 2*\prod*f*L = 2*\prod*50*0.5 = 157.08\ \Omega$

$Z = R + j\ X_L = 50 + j\ 157.08 = 164.84 \angle 72.33^\circ\ \Omega$

$I = V/Z = 200 \angle 0^\circ / 164.84 \angle 72.33^\circ = 1.213 \angle -72.33^\circ$ A

Pf = COS (72.33 º) = 0.30 lagging

$V_L = I * X_L = 1.213 \angle -72.33^o * 157.08 \angle 90^o = 190.53 \angle 17.67^o$ V

$V_R = I * R = 1.213 \angle -72.33^o * 50 = 60.65 \angle -72.33^o$ V

(OR)

28. (b). Explain the principle of operation of a different types of single-phase induction motor with neat sketches.

Any two types = 6 + 6 (Diagram: 2 marks, Operation: 4 marks)

29. (a) Explain the working principle and the construction of Permanent Magnet Moving Coil (PMMC) instruments with neat sketch.

Working principle: 5 marks, construction: 5 marks, Diagram: 2 marks

(OR)

29. (b) What is a rectifier? With neat circuit diagram and waveforms explain the operation of full wave rectifier (any one type) with and without capacitor filter.

Any one of types (center tap/bridge full wave rectifier)

Definition: 2 marks, operation: 4 marks, DC average value: 2 mark, diagram: 2 marks, waveform: 2 marks

30. (a) (i) With necessary diagrams explain the construction and operation of LVDT. (8)

Working: 4 marks, Construction: 2 marks, Diagram: 2 marks

(ii) Briefly explain Thermocouple. (4)

Working: 3 marks, Diagram: 1 mark

(OR)

(b) Write short notes on the following transducer:

(i) Phototransistor (4) **: Working: 3 marks, Diagram: 1 mark**

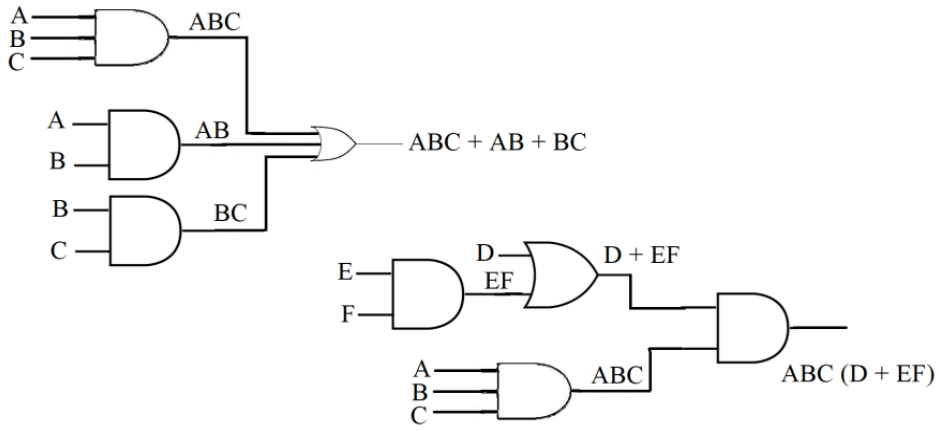
(ii) LED (4) **: Working: 3 marks, Diagram: 1 mark**

(iii) Photovoltaic cell (4) **: Working: 3 marks, Diagram: 1 mark**

31. (a) (i) Implement the following logic expressions with logic gates (6)

Y = ABC + AB + BC **(3 marks)**

Y = ABC (D + EF) **(3 marks)**



(ii) Using 3-variables K-Map simplify the given Boolean function (6).

F = X' Y Z + X' Y' Z + X Y Z' + X' Y' Z' + X Y Z + X Y' Z'

YZ	00	01	11	10
X' = 0	1	1	1	0
X = 1	1	0	1	1

Ans: F = Y' Z' + X' Z + X Y

(OR)

(b) (i) Define modulation. Give its classifications. (4)

Definition: 2 marks, classification: 2 marks

(ii) Explain the Frequency Modulation (FM) technique with equation and neat diagrams. (8)

Explanation: 6 marks, Diagram: 2 marks