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

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

**PART – A (20 x 1 = 20)**

1. Kirchoff's voltage law is based on _____ **(B) Law of conservation of energy**
2. If the three equal resistances of R ohms are connected in star, what is the equivalent resistance in delta connection? **(C) 3*R**
3. In a balanced star connected system, the relation between the line voltages ($V_L$) and phase voltages ($V_P$) is **(B) $V_P = V_L/\sqrt{3}$**
4. The active and apparent power of an A.C circuit is equal in magnitude. The circuit power factor is **(C) 1**
5. The area of B-H curve is equal to _____ **(B) Hysteresis loss**
6. Which of the machine doesn't have self-starting? **(D) Single phase induction motor**
7. The number of parallel path (A) in a lap wound DC machine is_____. **(C) P**
8. The relationship between torque (T) and armature current (Ia) for a DC shunt motor is **(A) Tα Ia**
9. Which of the following effect is used in AC ammeters? **(D) Electromagnetic**
10. In a BJT, if the collector-base junction is reverse-biased and the base-emitter junction is forward-biased, in which region the BJT is operating? **(C) Active region**
11. Zener diode acts as a voltage regulator only when it is connected in __ **(B) Reverse bias**
12. Component that eliminates fluctuations in rectified voltage and produces a relatively smooth DC voltage is_____ **(C) Filter**
13. Which of the following represent active transducer? **(D) Thermocouple**
14. What is the principle of operation of LVDT? **(A) Mutual inductance**
15. In photodiode, when there is no incident light, the reverse current is almost negligible and is called **(B) Dark current**
16. Which one of the following is not a source of power? **(B) Photoelectric cell**
17. Binary equivalent of octal number $(36.4)_8$ is _____ **(D) 011110.100**
18. $A.\bar{A}$ = _____ **(B) 0**
19. How many squares are required to construct the three variables K-map? **(D) 8**
20. Modulation is done in …….. **(A) Transmitter**

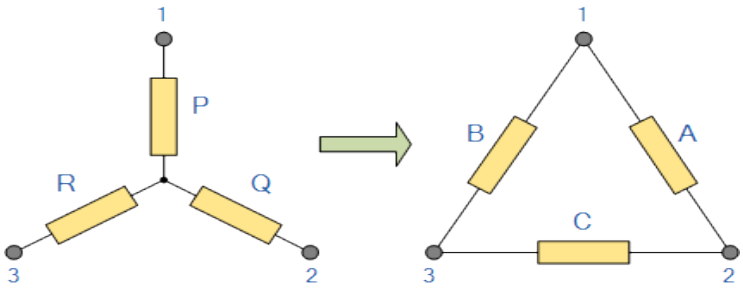
**PART-B (5 x 4 = 20 marks)**

21. State Thevenin's theorem with equivalent circuit.

**Definition: 2 mark, equivalent circuit and formula: 2 marks**

22. Give the star to delta equivalent resistance expression.

**Diagram: 1 mark , Each Equation: 1 mark**




$$A = \frac{PQ}{R} + Q + P \qquad B = \frac{RP}{Q} + P + R \qquad C = \frac{QR}{P} + Q + R$$

23. Derive an EMF equation of the single phase transformer.

$$E = N\frac{d\Phi}{dt}$$

$$E = N \times \omega \times \Phi_{max} \times \cos(\omega t)$$

$$E_{max} = N\omega\Phi_{max}$$

$$E_{rms} = \frac{N\omega}{\sqrt{2}} \times \Phi_{max} = \frac{2\pi}{\sqrt{2}} \times f \times N \times \Phi_{max}$$

$$\therefore E_{rms} = 4.44 f N \Phi_{max}$$

24. Briefly explain the clipper with neat diagram.

**Working: 3 mark, diagram: 1 mark**

25. What are active and passive transducers? Give examples.

**Definition of active and passive transducers: 3 mark,**

**Examples for active and passive transducers: 1 mark**

26. Explain the operation of universal gates with symbol and truth table.

**NAND and NOR Diagram: 1 mark, Truth table: 1 mark for each gate**

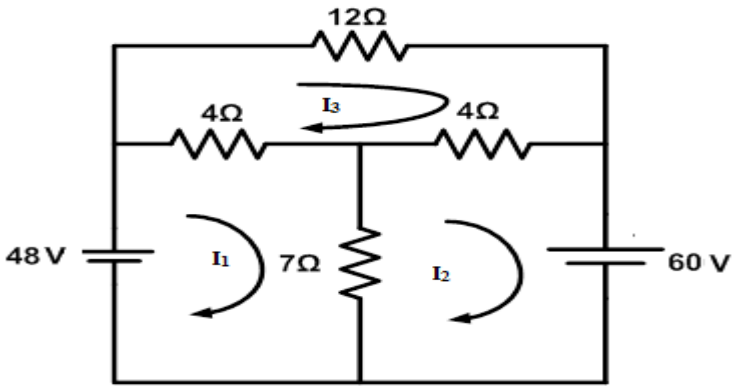
27. Convert $(4D6F.5E)_{16}$ , $(254.71)_8$ into decimal.

$(4D6F.5E)_{16} = (19823.3671875)_{10}$ **- 2 marks**

$(254.71)_8 = (172.890625)_{10}$ **- 2 marks**

**PART-C (5 x 4 = 20 marks)**

28. (a) Write the mesh equations for the circuit shown in figure and solve for the current in the 12 Ohm resistor.




**$11 I_1 - 7 I_2 - 4 I_3 = 48$;** **- (3 marks)**

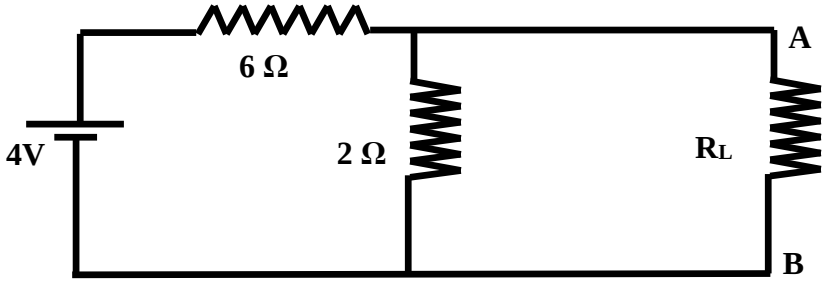
**$7 I_1 - 11 I_2 + 4 I_3 = 60$;** **- (3 marks)**

**$4 I_1 + 4 I_2 - 20 I_3 = 0$;** **- (3 marks)**

**$I_3 = -1$ A** **- (3 marks)**

**(OR)**

28. (b) Determine the value of load resistance $R_L$ when it is dissipating maximum power. Also find the maximum power dissipated in the load resistance for the circuit given below.



**$V_{Th}$ = 10 V; - 3 marks**
**$R_{Th}$ = 385 Ω; - 3 marks**
**Thevenin's equivalent circuit - 3 marks**
**$P_{max}$ = 0.0649 W or 64.9 mW - 3 marks**

29. (a) A resistance of 100 Ω is connected in series with a 50 μF capacitor. When the supply voltage is 200 V, 50 Hz, find the (i) Reactance (ii) Impedance (iii) Current (iv) Power factor (v) Voltage across resistor (vi) Voltage across capacitor. Also, draw the phasor diagram for all voltages and current.

**$X_C$, Z = each 1 mark; I, PF, $V_L$, $V_C$, phasor diagram = each 2 marks;**

Solution

Resistor R = 100 Ω; Reactance of the capacitor $X_C = \frac{10^6}{2\pi \times 50 \times 50} = 63.662\ \Omega$

Impedance $Z = (100 - j\,63.662) = 118.5447 \angle -32.48^0$

Taking the supply voltage as reference, $E = 200 \angle 0^0$ V

Current $I = \frac{E}{Z} = \frac{200\angle 0^0}{118.5447\angle -32.48^0} = 1.6871\angle 32.48^0$ A

Power factor = $\cos 32.48^0 = 0.8436$ leading

Voltage across resistor $V_R = 100 \times 1.6871 \angle 32.48^0 = 168.71 \angle 32.48^0$ V

Voltage across capacitor $V_C = -j\,63.662 \times 1.6871 \angle 32.48^0 = 107.4042 \angle -57.52^0$ V

**(OR)**

29. (b) Explain the construction and working principle of a DC generator with neat sketches.

**Working principle: 4 marks, construction: 4 marks, Diagram: 4marks**

30. (a) Explain the working principle and the construction of Moving Iron type instruments with neat sketch.

**Two types: attraction type and Repulsion type**

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

**(OR)**

(b) (i) With the help of VI characteristics show how a Zener diode is used as voltage regulator. (4)

**Working principle: 3 marks, Diagram: 2 marks**

(ii) Discuss the input and output characteristics of a BJT in Common Emitter configuration (8)

**Operation: 6 marks, diagram: 2 marks**

31. (a) (i) With necessary diagrams explain the construction and operation of strain gauge. (8)

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

(ii) Briefly discuss Thermistor. (4)

**Working: 3 marks, Diagram: 1 mark**

**(OR)**

(b) Write short notes on the following transducer:

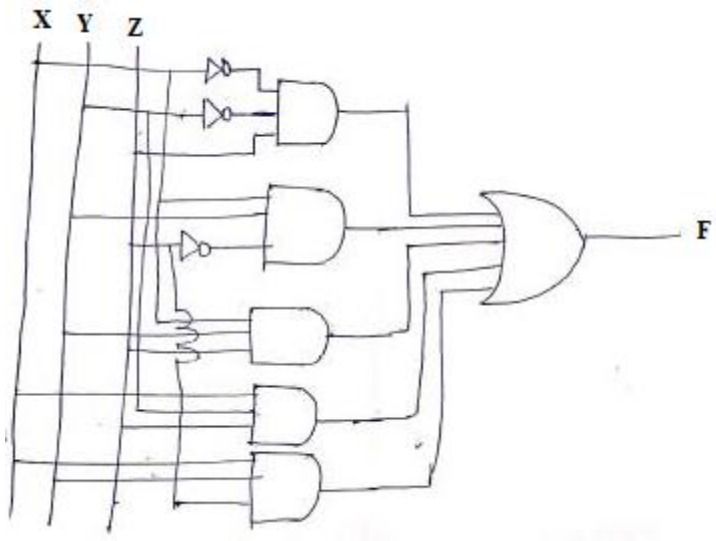
(i) Photovoltaic cell (4) **: Working: 3 marks, Diagram: 1 mark**

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

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

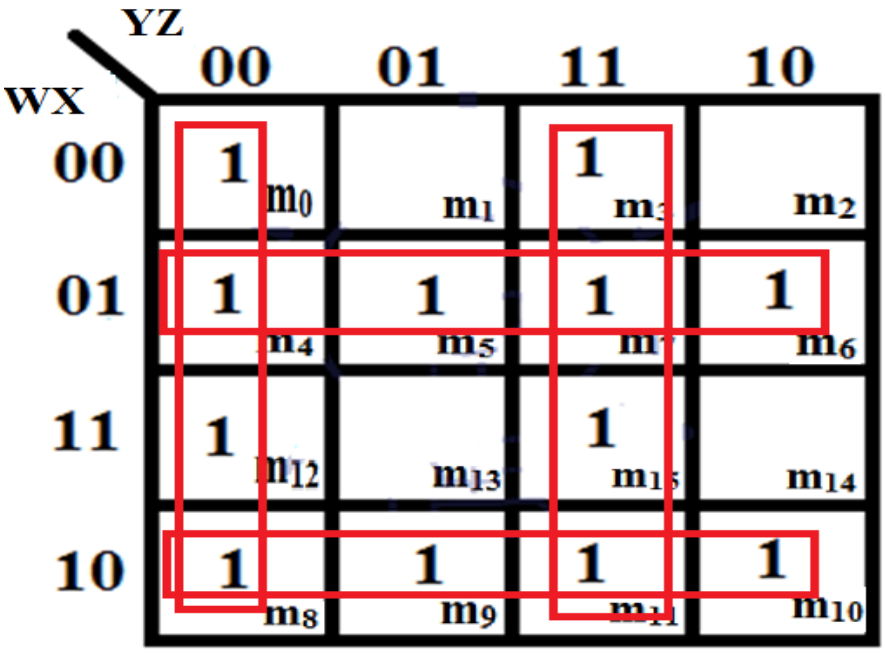
32. (a) (i) Realize the Boolean expressions using logic gates. (4)

$$F = \overline{X}\,\overline{Y}Z + \overline{X}Y\overline{Z} + \overline{X}YZ + X\overline{Y}Z + XY\overline{Z}$$



(ii) Using K-Map, simplify the given Boolean expression. (8)

$$F(w, x, y, z)= \Sigma (0,3,4, 5, 6,7,8,9,10,11,12,15)$$




**F = Y' Z' + YZ + WX' + W'X**

**(OR)**

(b) (i) Draw and explain the general block diagram of communication system. (4)

**Explanation: 2 marks, Diagram: 2 marks**

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

**Explanation: 6 marks, Diagram: 2 marks**