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**B.Tech/ M.Tech (Integrated) DEGREE EXAMINATION, MAY 2024**  
First & Second Semester

**21EES101T – ELECTRICAL AND ELECTRONICS ENGINEERING**  
(For the candidates admitted from the academic year 2022-2023 onwards)

**Note:**

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40<sup>th</sup> minute.
- (ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours

Max. Marks: 75

**PART – A (20 × 1 = 20Marks)**

Marks    BL    CO    PO

Answer **ALL** Questions

- |   |   |   |   |   |
|---|---|---|---|---|
| 1. When two resistors of $6\ \Omega$ are connected in parallel, the effective resistance value in the circuit is              | 1 | 1 | 1 | 1 |
| (A) $9\ \Omega$   |   |   |   |   |
| (B) $3\ \Omega$   |   |   |   |   |
| (C) $12\ \Omega$  |   |   |   |   |
| (D) $0.33\ \Omega$  |   |   |   |   |
| 2. The conduction for maximum power transfer in the circuit is the effective resistance of the circuit is equal to the        | 1 | 2 | 1 | 1 |
| (A) Square of load resistance   |   |   |   |   |
| (B) $2 \times$ load resistance  |   |   |   |   |
| (C) $\frac{1}{2}$ load resistance   |   |   |   |   |
| (D) Load resistance   |   |   |   |   |
| 3. The power factor can be determined by the formula  | 1 | 1 | 1 | 1 |
| (A) $\frac{R^2}{Z}$   |   |   |   |   |
| (B) $\frac{Z^2}{R}$   |   |   |   |   |
| (C) $\frac{Z}{R}$   |   |   |   |   |
| (D) $\frac{R}{Z}$   |   |   |   |   |
| 4. The line voltage is expressed in star connected network as   | 1 | 2 | 1 | 1 |
| (A) $V_L = \sqrt{2} V_{ph}$   |   |   |   |   |
| (B) $V_L = \frac{V_{ph}}{2}$  |   |   |   |   |
| (C) $V_L = V_{ph}$  |   |   |   |   |
| (D) $V_L = \sqrt{3} V_{ph}$   |   |   |   |   |
| 5. When +ve terminal of the battery is connected P-type and -ve terminal to the N-type of PN junction diode, the bias applied | 1 | 1 | 2 | 1 |
| (A) Forward bias  |   |   |   |   |
| (B) Reverse bias  |   |   |   |   |
| (C) Barrier bias  |   |   |   |   |
| (D) Saturation bias   |   |   |   |   |
| 6. To determine the input characteristics of CE configuration NPN transistor _____ is kept constant.                          | 1 | 1 | 2 | 1 |
| (A) Collector – Emitter voltage ( $V_{CE}$ )  |   |   |   |   |
| (B) Base-Emitter voltage ( $V_{BE}$ )   |   |   |   |   |
| (C) Base current ( $I_B$ )  |   |   |   |   |
| (D) Collector current ( $I_C$ )   |   |   |   |   |

7. The terminals of JFET are  
 (A) Anode and cathode (B) Emitter, base, collector  
 (C) Source, drain and gate (D) Emitter, gate, collector
8. The device that are designed to convert DC signal into AC signal are known as  
 (A) Choppers (B) Inverters  
 (C) Battery (D) Rectifier
9. The brushes in DC machine are made of  
 (A) Lamination sheets (B) Carbon  
 (C) Copper (D) Aluminium
10. The transformer works on the principle of  
 (A) Electromagnetic induction (B) Fleming's right hand rule  
 (C) Len's law (D) Fleming's left hand rule
11. The encoder in the servometer is used to determine the  
 (A) Stator current of the motor (B) Rotor current of the motor  
 (C) Stator voltage of the motor (D) Speed of the motor
12. Slip-ring rotor is a type of rotor of  
 (A) Stepper motor (B) BLDC motor  
 (C) DC motor (D) Three phase induction motor
13. The torque which is always present in the instrument whether it is connected to the supply or not is  
 (A) Moving torque (B) Damping torque  
 (C) Controlling torque (D) Deflecting torque
14. The eddy current produce the required damping torque opposing the motion of the moving coil in PMMC as per  
 (A) Len's law (B) Faraday's law  
 (C) Fleming's law (D) Self induction
15. The instrument which gives the storage of a digital waveform is  
 (A) Digital storage motor (B) Digital graph meter  
 (C) Digital storage oscilloscope (D) Digital multimeter
16. One example for active transducer is  
 (A) Capacitance (B) Thermocouple  
 (C) Inductive (D) Hall effect
17. The power factor in dc transmission system is  
 (A) 0.866 lagging (B) 0.5 lagging  
 (C) Unity (D) 0.5 leading
18. The most commonly used material for the manufacture of insulator in power system is  
 (A) Copper (B) Carbon  
 (C) Aluminium (D) Porcelain

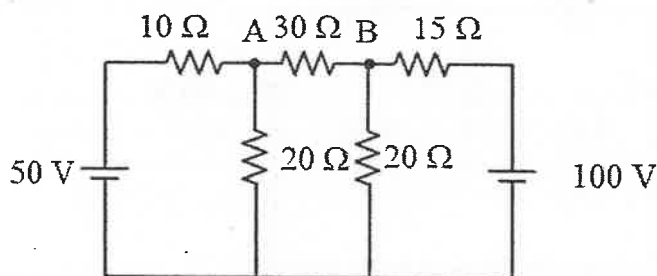
19. An electrical safety device that has the capability to protect the circuit from excessive current is 1 1 5 1  
 (A) Fuse (B) Insulator  
 (C) Switch (D) Regulator
20. One example for renewable energy source is 1 1 5 1  
 (A) Nuclear energy (B) Solar energy  
 (C) Thermal energy (D) Coal energy

**PART – B (5 × 8 = 40 Marks)**

Marks BL CO PO

Answer ALL Questions

21. a. Using nodal analysis, find the node voltage at the nodes A and B in the circuit shown below. 8 3 1 2



(OR)

- b. In RL series circuit the voltage and current equations are given as 8 3 1 2  
 $v = 282.84 \sin 314t$   
 $i = 70.71 \sin(314t - 60^\circ) A$   
 Find the circuit element values R, L, power factor and power consumed by the circuit.

22. a. Explain the construction, working and characteristics of SCR with necessary diagrams. 8 1 2 1

(OR)

- b. Describe the working and applications of different types of power converters. 8 1 2 1
23. a. Explain the construction and working principle of three phase induction motor with neat diagrams. 8 1 3 1

(OR)

- b. Draw the block diagram of chopper fed DC drive system and explain the operation. 8 1 3 1
24. a. Explain operation of moving iron instrument (repulsion type) with neat diagram. Also mention its application. 8 1 4 1

(OR)

- b. Describe the function and application of inductive transducer and proximity sensor. 8 1 4 1

25. a. Draw the key diagram of 11kV/400 V indoor substation and describe the operation of each component. 8 1 5 1

(OR)

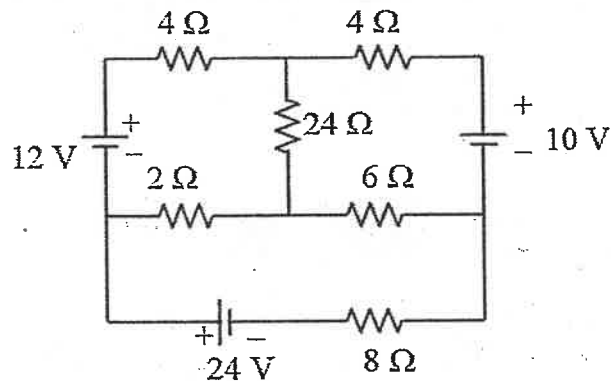
- b. Describe the operation of any two types of EV with suitable block diagrams. 8 1 5 1

**PART – C (1 × 15 = 15 Marks)**

Marks BL CO PO

Answer ANY ONE Question

26. Determine the current flowing through  $8\ \Omega$  resistor power consumed by it in the circuit shown below using mesh analysis. 15 3 1 2



- 27.i. Obtain the simplified expression for the function  $F$  using K-map and draw the logic design  $F(A,B,C,D) = \sum m(0,1,2,4,5,7,9,10,12,13)$ . 8 3 2 2
- ii. Design a logical diagram for the function  $Q$  using K-map simplified expression  $Q(A, B, C, D) = \prod m(1,2,3,7,9,10,11,15)$  7 3 2 2

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