

ELECTRICAL ENGINEERING

Paper : II

Grade : V(B) Diploma

Full Marks - 200

Time - Three hours

The figures in the margin indicate full marks for the questions.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A 15 × 6 = 90

Answer all questions.

Each question carries 6 (six) marks.

1. What is Zener diode ? State its use for voltage stabilisation.
2. Explain use of a BJT as a voltage amplifier using common emitter connection.
3. Give the circuit diagram of a low pass filter using OPAMP.
4. A battery of 150 Amp-hour rating has discharge rate of 10 Amps. What does it mean ?

[Turn over

5. Explain with diagram the method of extending the range of an ammeter.
6. Name different types of relays provided to protect EHT power transformers.
7. Define :
 - (a) Deflecting torque
 - (b) Controlling torque and
 - (c) Damping torque of an indicating type instrument.
8. Explain in short measuring of an unknown frequency of a signal by CRO.
9. Give two applications of current transformer and potential transformer in power supply system.
10. Explain with diagram measurement power of a 3-phase balance supply with the help of two wattmeters.
11. Name different tests to be conducted before energizing a medium voltage installation.
12. Why commutators are used in D.C machines and not in A.C machines ?

13. Find Laplace transformation of an unit impulse function.
14. Two inductors, of inductance L , are connected in series. If the equivalent inductance is $2.5L$, find out the value of coupling co-efficient.
15. For a series RLC circuit, find out the resonance frequency and band width.

GROUP - B 40 × 2 = 80

Answer all the questions.

Each question is having four alternatives. Select and write down the correct answer in answer book.

1. Unit of inductance is

- (a) Ohm (b) Columb
(c) Henry (d) Farad

2. Energy stored in a capacitor is

- (a) $\frac{1}{2} CV^2$ joule (b) CV^2 joule
(c) $\frac{CV}{2}$ joule (d) CV joule

3. In a pure capacitive a.c circuit, the current
- (a) lags behind the voltage
 - (b) leads the voltage
 - (c) remain in phase with voltage
 - (d) remain 180° out of phase with voltage
4. The RMS value of the function $f = 10 \sin \omega t$ is equal to
- (a) 7
 - (b) 10
 - (c) 7.07
 - (d) 6.37
5. Laplace transformation is a
- (a) Complex frequency transformation
 - (b) Pure imaginary frequency transformation
 - (c) Discrete frequency transformation
 - (d) None of the above
6. Parallel combination of two resistances R_1 and R_2 is equal to
- (a) $R_1 + R_2$
 - (b) $\frac{R_1 \times R_2}{R_1 + R_2}$
 - (c) $\frac{1}{2} R_1 + \frac{1}{2} R_2$
 - (d) $R_1 \times R_2$

7. Force between two charged particles is called
- (a) Magnetic force
 - (b) Coulomb force
 - (c) Gravitational force
 - (d) Bouncy force
8. A d.c voltage V is applied to a series RC circuit. Current I at $t = 0$ is equal to
- (a) $\frac{V}{C}$
 - (b) $\frac{V}{RC}$
 - (c) $\frac{VR}{C}$
 - (d) $\frac{V}{R}$
9. Time constant of a RL circuit is
- (a) LR
 - (b) $\sqrt{LR}$
 - (c) $\frac{L}{R}$
 - (d) $\frac{R}{L}$
10. Phase difference between primary emf and secondary emf in a single phase transformer is
- (a) 270 degree
 - (b) 0 degree
 - (c) 90 degree
 - (d) 180 degree

11. Which among the following is a scalar quantity ?

- (a) Electric field intensity (E)
- (b) Electric potential (V)
- (c) Flux density (B)
- (d) Magnetic field intensity (H)

12. A transformer having single winding is called

- (a) Isolation transformer
- (b) Auto transformer
- (c) Step-up transformer
- (d) Step-down transformer

13. Which of the following elements block d.c in steady state condition ?

- | | |
|--------------|-----------------------|
| (a) Inductor | (b) Capacitor |
| (c) Resistor | (d) PN junction diode |

14. A thyristor consists of junction

- | | |
|----------|-----------|
| (a) PN | (b) PNP |
| (c) PNPN | (d) PNPNP |

12/TR/TES/E-II/V(B)/13 (6)

15. Under-mentioned which element is an unidirectional element ?
- (a) Diode (b) Resistor
(c) Capacitor (d) Inductor
16. Which type of motor does not have self-starting torque ?
- (a) 3-ph induction motor
(b) D. C series motor
(c) D. C shunt motor
(d) Synchronous motor
17. Application of proportional plus derivative control gives rise to
- (a) Damping factor
(b) Peak time
(c) Rise time
(d) Peak overshoot
18. In ON-OFF control, if T_{on} is ON time and T_{off} is OFF time, then duty cycle is equal to
- (a) $\frac{T_{on}}{T_{off}}$ (b) $\frac{T_{off}}{T_{on}}$
(c) $\frac{T_{off}}{T_{on} + T_{off}}$ (d) $\frac{T_{on}}{T_{on} + T_{off}}$

19. In a High Pass filter

- (a) Gain is low at high frequency
- (b) Gain is high at high frequency
- (c) Gain is low at low frequency
- (d) Gain is high at low frequency

20. Material used for transistor is

- (a) Semi conductor
- (b) Super conductor
- (c) conductor
- (d) Insulator

21. Multivibrator is a

- (a) Sine wave generator
- (b) Square wave generator
- (c) Pulse Train generator
- (d) Triangular wave generator

22. For an ideal OPAMP

- (a) Output impedance is infinite
- (b) Output impedance is finite
- (c) Input impedance is infinite
- (d) Input impedance is finite

23. Field Effect Transistor is a

- (a) VCVS (Voltage controlled voltage source)
- (b) CCCS (Current controlled current source)
- (c) CCVS (Current controlled voltage source)
- (d) VCCS (Voltage controlled current source)

24. In a Thyristor, pulse is given to

- (a) Gate terminal
- (b) Anode terminal
- (c) Cathode terminal
- (d) None of the above

25. Type of earthing provided in electrical installation is

- (a) Pipe earthing
- (b) Plate earthing
- (c) Strip earthing
- (d) All the above

26. The minimum value of current after which a thyristor gets ON is called

- (a) Holding current
- (b) Conduction current
- (c) Latching current
- (d) Displacement current

27. For a D.C signal

- (a) RMS value is greater than average value
- (b) RMS value is twice the average value
- (c) Average value is greater than RMS value
- (d) Average value and RMS value are same

28. Which type of fault does not have zero sequence current component ?

- (a) Line to line ground fault
- (b) 3-phase short circuit
- (c) Line to line fault
- (d) Line to ground fault

29. Linear variable differential transformer measures
- (a) Velocity
 - (b) Temperature
 - (c) Current
 - (d) Small displacement

30. Which of the following statements is correct ?

- (a) Secondary of a current transformer should remain always shorted
- (b) Primary of a current transformer should always be shorted
- (c) Secondary of a potential should always be shorted
- (d) Secondary of a current transformer should always be kept open

31. A current $i(t) = 5 \sin \omega t$ is passed through a permanent magnet moving coil instrument. The reading in the instrument will be

- (a) 5 Amps
- (b) 0 Amps
- (c) 3.5 Amps
- (d) 3 Amps

32. The output for a two input OR gate is

(a) $Y = A \cdot B$

(b) $Y = \overline{AB}$

(c) $Y = \overline{A} + B$

(d) $Y = A + B$

33. CRO uses

(a) Electro-magnetic focussing

(b) Electro-static focussing

(c) Both types of focussing

(d) None of these

34. The minimum value of a quantity measured by an instrument is called

(a) Sensitivity

(b) Accuracy

(c) Percentage of error

(d) Resolution

35. The internal resistance of a voltmeter should be
- (a) Very low
 - (b) Very high
 - (c) Dependent on range of voltmeter
 - (d) None of the above
36. A.C. Tacho-generator gives voltage output proportionate to
- (a) RPM input
 - (b) Acceleration input
 - (c) Input current
 - (d) Input voltage
37. A galvanometer has
- (a) Air friction damping
 - (b) Spring controlled damping
 - (c) Eddy current damping
 - (d) Fluid friction damping
38. A flip flop is a
- (a) MOD 4 counter
 - (b) MOD 8 counter
 - (c) MOD 16 counter
 - (d) MOD 2 counter

39. Capacitor in an a.c circuit is provided for
- (a) Improving power factor
 - (b) Decreasing eddy current loss
 - (c) Minimize hysteresis loss
 - (d) Increasing the frequency

40. The resistance of the earth is
- (a) Infinite
 - (b) Near zero
 - (c) 1 M-ohm
 - (d) 20 M-ohm

GROUP - C

5×6=30

Answer all the questions.

Each question carries 6 (six) marks.

1. A half wave rectifier uses a diode with 300 ohm resistance. If the A.C input is 200V (RMS) and load is 1200 ohm, calculate the average RMS value of load current.
2. A strain gauge having 120 ohm resistance and gauge factor 2 is connected in series with 120 ohm resistance across 12V D.C supply. Calculate the difference voltage across the strain gauge with no stress applied condition and 140 N/Sq.mt stress applied condition. Young's Modulus is 200000 N/Sq.mt.

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A load draws 200 watt real power from a source at 0.8 power factor lagging. What is the value of reactive power drawn ?

Find out the value of maximum power that a 12 Volt D.C source with internal resistance of 2 ohm can supply to a resistive load.

Calculate emitter current in a transistor for which base current is 20 milliamps and current amplification factor is equal to 50.