

TR/TEE-E-II/V(B)/13

**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 systems.
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 ?

12/TR/TES/E-II/V(B)13 (2)

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

$40 \times 2 = 80$

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

12/TR/TESE-II/V(B)/13

(3)

[Turn over

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  $180^\circ$  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)  $R_1 \times R_2$
- 12/TR/TESE-II/V(B)/13 (4)

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)  $\frac{T_{on}}{T_{on} + T_{off}}$

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

(7)

[Turn over

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) Cathod 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

12/TR/TES/E-II/V(B)/13 (9)

[Turn over

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) Light 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.

12/TR/TES/E-II/V(B)/13 (14)

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.