Objectives Questions: Electrical Engineering

ANSWER KEY

Q No.	Option	Q No.	Option
1	**d**	21	**b**
2	**b**	22	**a**
3	**c**	23	**d**
4	**a**	24	**b**
5	**b**	25	**d**
6	**a**	26	**c**
7	**d**	27	**b**
8	**b**	28	**c**
9	**b**	29	**b**
10	**b**	30	**b**
11	**a**	31	**c**
12	**c**	32	**c**
13	**d**	33	**a**
14	**d**	34	**d**
15	**d**	35	**d**
16	**a**	36	**d**
17	**a**	37	**c**
18	**c**	38	**c**
19	**d**	39	**b**
20	**b**	40	**c**

As second term examiner

09.09.24

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Ph.D. Entrance Examination of Electrical Engineering (EE)

Q1. A 20-turn iron-cored inductor is connected to a 100 V, 50 Hz source. The maximum flux density in the core is 1 Wb/m^2. The cross-sectional area of the core is:

a) 0.152 m^2 b) 0.345 m^2
c) 0.056 m^2 d) 0.0225 m^2

Q2. In an iron cored coil the iron core is removed so that the coil becomes an air cored coil. The inductance of the coil will be:

a) increase
b) decrease
c) remain the same
d) initially increase and then decrease

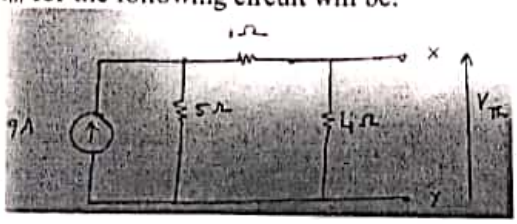
Q3. During short circuit test on single phase transformer iron losses are negligible because:

a) the current on secondary side is negligible
b) the voltage on secondary side does not vary.
c) the voltage applied on primary side is low
d) full-load current is not supplied to the transformer

Q4. A 3phase, 50 Hz, 6pole induction motor runs at 96 percent of the synchronous speed. The actual speed is:

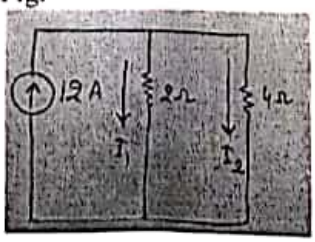
a) 950rpm b) 1000rpm
c) 1425rpm d) 920rpm

Q5. The value of V_{th} and R_{th} for the following circuit will be:



a) 36 V,2.5 Ohm
b) 18 V, 2.4 Ohm
c) 36 V, 2.4 Ohm
d) 18 V, 10 Ohm

Q6. Find I_1 and I_2 in the following Fig.



a) 8 A, 4 A
b) 4 A, 8 A
c) 6 A, 6 A
d) 10 A, 2 A

Q7. The line current in a three phase four wire system is 12 A under balanced load condition. The neutral current will be:

a) 36A b) 4 A
c) 3 A d) 0 A

Q8. A battery of emf of 4 V has an internal resistance of 0.2 Ohm. When a load resistance of 1.8 Ohm is connected across it, the potential difference across its terminal will be:

a) 4 V b) 3.6 V
c) 0 V d) 2V

Q9. Voltage applied across a ceramic dielectric produces an electrolytic field 100 times greater than air. What will be the value of dielectric constant:

a) 50 b) 100
c) 150 d) 200

Q10. Which of the following statements is incorrect:

a) The leakage resistance of ceramic capacitors is generally high
b) The stored energy in a capacitor decreases with reduction in value of capacitance
c) The stored energy in a capacitor increases with applied voltage
d) A wire cable has distributed capacitance between the conductors.

Q11. "The surface integral of the normal component of the electric displacement D over any closed surface equals the charge enclosed by the surface".
The above statement is associated with:

a) Gauss's law b) Kirchhoff's law
c) Faraday's law d) Lenz's law

Q12. Load flow study is carried out for:

a) Fault calculations b) Stability studies
c) System planning d) Load frequency control

Q13. Two infinite parallel plates 10 mm apart have maintained between them a potential difference of 100 V. The acceleration of an electron placed between them is:

(a) 0.56×10^{15} m/s^2 (b) 1.5×10^{15} m/s^2
(c) 1.6×10^{15} m/s^2 (d) 1.76×10^{15} m/s^2

Q14. Which among the below specified conditions of discrete time in terms of real constant 'a', represents the double-sided decaying exponential signal:

a) $a > 1$ b) $0 < a < 1$
c) $a < -1$ d) $-1 < a < 0$

Q15. Which among the following are the stable discrete time systems:

1. $y(n) = x(4n)$
2. $y(n) = x(-n)$
3. $y(n) = ax(n) + 8$
4. $y(n) = \cos x(n)$

a) 1 & 3 b) 2 & 4
c) 1, 3 & 4 d) 1, 2, 3 & 4

Q16. Which mathematical notation specifies the condition of periodicity for a continuous time signal:

a) $x(t) = x(t + T_0)$ b) $x(n) = x(n + N)$
c) $x(t) = e^{-at}$ d) None of the above

Q17. Which condition determines the causality of the LTI system in terms of its impulse response:

a) Only if the value of an impulse response is zero for all negative values of time
b) Only if the value of an impulse response is unity for all negative values of time
c) Only if the value of an impulse response is infinity for all negative values of time
d) Only if the value of an impulse response is negative for all negative values of time

Q18. The full load copper loss of a transformer is 1200W. At half load the copper loss will be:

a) 600 W b) 1200 W
c) 300 W d) 900 W

Q19. A 20kVA, 2200/220 V, 50 Hz single phase transformer has its primary winding resistance of 0.8 Ohm. The resistance of primary referred to secondary is:

a) 0.8 Ohm b) 8 Ohm
c) 80 Ohm d) 0.008 Ohm

Q20. A three-phase synchronous motor has been provided with a damper winding. It can be started as:

a) a 3-phase synchronous motor
b) a 3-phase induction motor
c) a single-phase induction motor
d) a 3-phase alternator

Q21. If the frequency of the generated emf of a three-phase alternator is to be 60Hz. The highest possible speed at which the alternator should be run is:

a) 3000rpm b) 3600rpm
c) 6000rpm d) 7200rpm

Q22. The mechanical power developed at the rotor of a three-phase induction motor is 10kW at a slip of 5 percent. The total rotor copper losses per phase will be:

a) 526W b) 600W
c) 720W d) 300W

Q23. An 8-pole, 3-phase, 50 Hz induction motor is operating at a speed of 700 rpm. The frequency of the rotor current of the standstill motor in Hz is:

a) 3.33 Hz b) 6.67 Hz
c) 7.14 Hz d) 50Hz

Q24. Which of the given device is the most suitable power device for a higher frequency (above 100 kHz) switching application:

a) SCR b) Power MOSFET
c) GTO d) BJT

Q25. Which of the single-phase Induction motor is best suited for ceiling fans:

a) Resistance split
b) Capacitor start only
c) Capacitor start and capacitor run
d) Permanent capacitor split

Q26. What is the power generated by an alternator in one hour if the discharge is 1 m^3/s and head of the water is 1m, (assume 100% efficiency of generator and turbine):

a) 10 kW b) 73/75 kW
c) 746/75 kW d) 100 kW

Q27. A hydroelectric power station is supplied from a reservoir of capacity 3×10^7 m^3 at a head of 150 m. The overall efficiency of the power plant is 70%. Energy available from the plant will be:

a) 12.2625×10^6 kWh b) 8.58375×10^6 kWh
c) 1.25×10^6 kWh d) 0.875×10^6 kWh

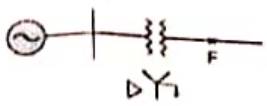
Q28. If in a line, resistance and reactance are found to be equal and regulation is zero, then load will have:

a) unity pf b) zero pf
c) 0.707 leading pf d) 0.707 lagging pf

Q29. The per unit impedance of a circuit element is 0.30. If the base kV and base MVA are halved, then the new value of per unit impedance of the circuit element will be:

a) 0.30 b) 0.60
c) 0.0030 d) 0.0060

Q30. For the system shown in diagram below, a line-to-ground fault on the line side of the transformer is equivalent to:



a) A line-to-ground fault on the generator side of the transformer
b) A line-to-line fault on the generator side of the transformer
c) A double line-to-ground on the generator side of the transformer
d) A 3-phase fault on the generator side of the transformer.

Q31. What would be the intersection of the asymptotes of the root loci of a given system with a transfer function $G(s)H(s) = \frac{K}{s(s+1)(s+3)}$ with an open-loop:

a) 1.33 b) 1.44
c) -1.33 d) -1.44

Q32. A given control system yields a 0.20 steady-state error for a unit step input. We cascade a unit integrator to this system and then apply unit ramp input to this modified system. For this modified system, what would be the actual value of steady-state error:

a) 0.20 b) 0.10
c) 0.25 d) 0.15

Q33. For the system governed by the set of equations:

$dx_1/dt = 2x_1 + x_2 + u$
$dx_2/dt = -2x_1 + u$
$y = 3x_1$

the transfer function Y(s)/U(s) is given by:

a) $3(s+1)/(s^2 - 2s + 2)$
b) $3(2s+1)/(s^2 - 2s + 1)$
c) $(s+1)/(s^2 - 2s + 1)$
d) $3(2s+1)/(s^2 - 2s + 2)$

Q34. In a transistor switch, the voltage changes from base-to-emitter which is adequate to accomplish the switching is only about:

a) 0.2 V b) 0.4 V
c) 0.1 V d) 0.5 V

Q35. The number of select input lines required by a 1-to-8 demultiplexer are:

a) Two b) One
c) Four d) Three

Q36. The voltage between the emitter and collector of a silicon transistor when the transistor is biased to be at the edge of saturation is:

a) 5 volts b) 10 volts
c) 0.1 volts d) 0.3 volts

Q37. For measuring a very high resistance we should use:

(a) Kelvin's double bridge
(b) Wheat stone bridge
(c) Meggar
(d) None of the above

Q38. It is required to measure the true open circuit e.m.f. of a battery. The best device is:

(a) D.C. voltmeter
(b) Ammeter and a known resistance
(c) D.C. potentiometer
(d) None of the above

Q39. The power factor of a single-phase load can be calculated if the instruments available are:

(a) one voltmeter and one ammeter
(b) one voltmeter, one ammeter and one wattmeter
(c) one voltmeter, one ammeter and one energy meter
(d) any of the above

Q40. Circuit turn-off time of an SCR is defined as the time:

a) taken by the SCR turn off
b) required for the SCR current to become zero
c) for which the SCR is reverse biased by the commutation circuit
d) for which the SCR is reverse biased to reduce its current below the holding current