

ELECTRICAL ENGINEERING

PRACTICE SET- 4

Q.1 The transformed current in a certain branch of circuit is $(2s + 10) / (s)(s+2)$. The current has a final value of

- (a) 0 (b) 2 (c) 3 (d) 5

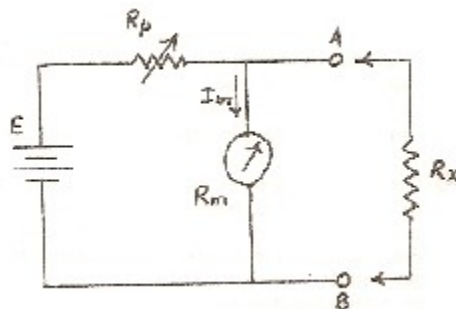
Q2. A transverse electromagnetic wave with circular polarization is received by a dipole antenna. Due to polarization mismatch, the power transfer efficiency from the wave to the antenna is reduced to about

- (a) 50% (b) 33.3% (c) 25% (d) 0%

Q3. In dielectric heating, if the capacitor is loss free, the heat produced will be

- a. Zero
- b. Infinity
- c. Proportional to the value of capacitance.
- d. Proportional to the frequency.

Q4. A shunt type ohmmeter is shown in the figure below. With disconnected, the meter reads full scale. 'S' represents the meter current as a fraction of full scale current with connected such the



$$S = \frac{R_x}{R_x + R_p}$$

The value of R_p is given by

- (a) R_m (b) $R_1 + R_m$
(c) $\frac{R_1 R_x}{(R_1 + R_m)}$ (d) $\frac{R_1 + R_m}{(R_1 + R_m)}$

Q5. The open loop transfer function of a control system is given by

The smallest possible value of 'a' for which this system is stable in the closed-loop for all positive values of K is

- (a) 0
- (b) 8
- (c) 10
- (d) 12

Q6. A DOC formatted Hard Disk has following parameters

No. of Cylinders = 1000

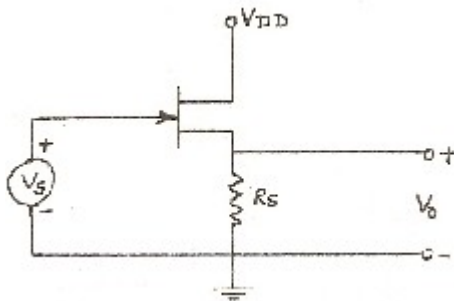
No. of Heads = 5

17 sectors per cylinder

What is the total Disk Capacity?

- (a) 10 MB
- (b) 32 MB
- (c) 85 Mb
- (d) 42.5 MB

Q7.



$R_S = 3 \text{ K}$. Given $\beta = 0.9$, the value of β is given by

- (a) 0.3 mA / V
- (b) 0.33 mA / V
- (c) 3.0 mA / V
- (d) 3.0 A / V.

Q8. PGM systems require regenerative repeaters overlong distances. The correct sequence of the operations which such a repeater performs is

- (a) Timing, equalization and decision making.
- (b) Equalization, timing and decision making.

(c) Timing, thresholding (decision) and equalization.

(d) Thresholding, timing and equalization.

Q9. Consider the following set of instructions:

STC

CMC

MOV A, B

RAL

MOV B, A

This set of instructions

(a) Doubles the number in Register by B.

(b) Divides the number in Register by 2.

(c) Multiplies B by A

(d) Adds A and B.

Q10. The properties of air are

- I. Dry bulb temperature
- II. Wet bulb temperature
- III. Dew point temperature
- IV. Saturation temperature

In case the relative humidity of air is 100% then which of the above temperature will be equal?

- (a) 1 and 2 only
- (b) 3 and 4 only
- (c) I and 3 only
- (d) 1, 2, 3 and 4.

Q11. Semiconductor A has a higher band gap than semiconductor B. If both A and B have the same dimension, the same number of electrons at a given temperature and the same electron and hole mobilities, then

- (a) A has the same number of holes as B
- (b) A has a larger number of holes than B
- (c) A has less number of holes than B
- (d) Any of the above statements (a), (b) or (c) could be true.

Q12. In transformers, disc coil are generally preferred for

- (a) Leading power factor.
- (b) High voltage winding.
- (c) Constant load.
- (d) Low voltages winding.

Q13. Unbalanced supply voltage given to a 3-phase, delta-connected induction motor will cause

- (a) Zero sequence currents
- (b) Less heating of the rotor.
- (c) Negative sequence component current.
- (d) All of the above.

Q14. In ac series motor the purpose of providing compensating winding is to

- (a) Reduce sparking at brushes.
- (b) Increase the torque.
- (c) Reduce heating of armature.
- (d) Minimum vibration.

Q15. The parameters connected with the operation of a synchronous motor are

- I. Speed
- II. Power factor
- III. Armature current.

When the excitation of the motor is varied, which parameters vary along with it.

- (a) 1 only
- (b) 2 only
- (c) 2 and 3 only
- (d) 1,2 and 3

Q16. In series parallel control of dc series motors

- (a) Speed in series arrangement is four times the speed in parallel arrangement.
- (b) Speed in series arrangement is one fourth the speed in parallel arrangement.
- (c) Speed in series arrangement is double of the speed in parallel arrangement.
- (d) Speed in series arrangement is half of the speed in parallel arrangement.

Q17. Grounding is generally done in transmission line at

- (a) The supply end
- (b) The receiving end
- (c) Middle of the line
- (d) Any where.

Q18. The transformed current in a certain branch of a circuit is $(2s+50 / (s+1) (s+1) (s+3))$. The value of the current for $t=0$ is

- (a) 0
- (b) 2
- (c) 3
- (d) 5

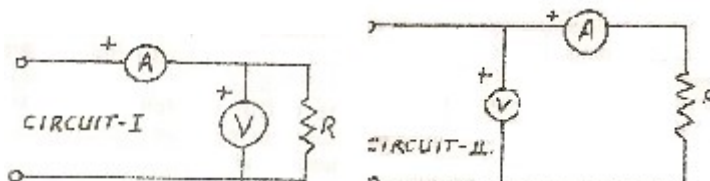
Q19. Which of the following relations is correct?

- (a) $(AB) =$
- (b) $(AB) =$
- (c) $(AB) =$
- (d) All the three.

Q20. A thyristorised, three phase, fully controlled converter feeds a dc load that draws a current. Then the input ac line current to the converter has

- (a) An rms value equal to the dc load current
- (b) An average value equal to the dc load current
- (c) A peak value equal to the dc load current
- (d) A fundamental frequency component, whose rms value is equal to the dc load current,.

Q21. The power in a resistor R is estimated by measuring the voltage and current using the voltmeter-ammeter method. Two different arrangements can be used as shown in circuits 1 and 2. Less erroneous results are obtained by adopting.



- (a) Circuit 1 for low values of R
- (b) Circuit 2 for low values of R
- (c) Circuit 1 for high values of R
- (d) Circuit 2 for low and high values of R.

Q22. The open loop transfer function of a unity negative feed back control system is given by

$$G(s) = K(s+2)/(s+1)(s-70)$$

For $K = 6$, the stability characteristics of the open-loop and closed loop configurations of the system are respectively

- (a) Stable and stable
- (b) Unstable and stable
- (c) Stable and unstable
- (d) Unstable and unstable.

Q23. A relation over the set $s = (x, y, z)$ is defined by $(x, x), (x, y), (y, x), (x, z), (y, z), (y, y), (z, z)$ what properties hold for this relation?

- I. Symmetry
- II. Reflexivity
- III. Antisymmetry
- IV. Irreflexivity.

- (a) 1 only
- (b) 2 only
- (c) 1 and 2
- (d) 1 and 1

Q24. A saw-tooth generator is built using a UJT with a constant current-charged capacitor C of $1 \mu\text{f}$ driving the emitter. If the voltage is 15 V and the capacitor charging current is 1 mA, then the period of the saw-tooth is approximately

- (a) 10 ms
- (b) 1 ms
- (c) 0.1 ms
- (d) 0.01 ms

Q25. Consider the following communication systems

1. Technology
2. Radio communication
3. Microwave communication
4. Optical sequence of these systems from the point of view of increase of base band channels each of them can accommodate is

- (a) 2,4,3,1
- (b) 3,4,1,2
- (c) 1,2,3,4
- (d) 4,2,1,3

Q26. The number of bits needed to address 4K memory is

- (a) 6
- (b) 8
- (c) 12
- (d) 16

Q27. Three rods one made of glass, one of pure aluminum and one made of wrought iron are heated to 150°C. All the rods are 15 mm in diameter and 300 mm long. The lowest temperature at the free end of the rods will occur in case of

- (a) Aluminum rod
- (b) Wrought iron rod
- (c) Glass rod
- (d) Temperature will be same for all the three rods at free.

Q28. With respect to a completely filled band, which one of the following statements is correct?

- (a) The total wave vector and the total velocity of all electrons in the band is always zero.
- (b) The total wave vector and the total velocity of all the electrons in the band is not necessarily zero.
- (c) Both (a) and (b) above.
- (d) None of the above.

Q29. Buchholz relay works on the principle of

- (a) Production of eddy currents whenever load changes are rapid.
- (b) Ionization of transformers oil.

- (c) Magnetic hum due to sudden variation in load.
- (d) Generation of gas due to breakdown of the insulation.

Q30. When the supply voltage to an induction motor is reduced by 10% the maximum torque will decrease by approximately

- (a) 5%
- (b) 10%
- (c) 20%
- (d) 40%

Q31. Consider the following statements regarding fractional horse power shaded-pole motor:

1. Its direction of rotation is from unshaded to shaded portion of the poles.
2. Its direction of rotation is from shaded to unshaded portion of the poles.
3. It can remain stalled for short periods without any harm.
4. It has a very poor power factor.

Of these statements

- (a) 1,3 and 4 are correct
- (b) 2,3 and 4 are correct
- (c) 2 and 4 are correct
- (d) 1 and 3 are correct

Q32. The negative phase sequences in a three phase synchronous motor exist when

- (a) Motor is overloaded
- (b) Motor is under loaded
- (c) Unbalanced voltage is supplied
- (d) Motor armature is hot.

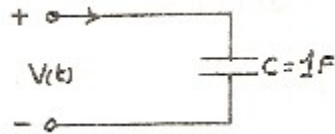
Q33. Multiplex lap winding is used

- (a) To reduce commutation difficulties.
- (b) To increase voltage of machine.
- (c) To increase number of parallel paths.
- (d) To reduce armature reaction effect.

Q34. Temperature increase produces the following effect on a transmission line

- (a) Tension of the conductor and its sag increase.
- (b) Tension of the conductor and its sag decrease
- (c) Tension of the conductor decreases and its sag increases.
- (d) Tension of the conductor increases and its sag decreases.

Q35. If in the figure shown $V(t) = t$, then $I(t)$ will be a unit



- (a) Step function.
- (b) Impulse function.
- (c) Doublet function.
- (d) Triplet function.

Q36. Is equal to

- (a) 0
- (b) 1
- (c)
- (d) None of these.

Q37. Triangular PWM control, when applied to a three phase, BJT based voltage source inverter, introduces

- (a) Low order harmonic voltages on the dc side
- (b) Very high order harmonic voltages on the dc side
- (c) Low order harmonic voltages on the ac side
- (d) Very high order harmonic voltage on the dc side.

Q38. A 150 V moving iron voltmeter of accuracy class 1-0 reads 75V when used in a circuit under standard conditions. The maximum possible percentage error in the reading is

- (a) 0.5
- (b) 1.0
- (c) 2.0

(d) 4.0

Q39. A Phase-lag compensation will

- (a) Improve relative stability.
- (b) Increase the speed of response.
- (c) Increase bandwidth.
- (d) Increase overshoot.

Q40. Function of a Modem is

- (a) To convert Digital Data to high frequency analog data.
- (b) Convert digital data to Analog signal and back.
- (c) Convert analog signals to digital signal.
- (d) Increase the voltage level of the data.

Q41. Match List-1 with List-2 and select the correct answer using the codes given below the lists:

List -1

List -2

- | | |
|-------------------------------------|--|
| A. Darlington amplifier in | 1. A circuit using pnp and npn transistors; used power amplifier. |
| B. Common Base amplifier | 2. A common source amplifier driving a common-gate amplifier. |
| C. Complementary symmetry Amplifier | 3. A circuit with overall voltage gain close to 1 and very large input |
| D. Cascode amplifier | 4. A circuit with low input impedance; mainly used in high |
| | Frequency application |

Codes:

- | | | | |
|-------|---|---|---|
| (a) A | B | C | D |
| 1 | 2 | 1 | 2 |
| (b) A | B | C | D |
| 2 | 1 | 2 | 1 |
| (c) A | B | C | D |
| 3 | 4 | 1 | 2 |
| (d) A | B | C | D |
| 4 | 3 | 2 | 1 |

Q42. When power ratios are expressed in dBm, the reference power is

- (a) 1 W
- (b) 1 mW
- (c) 1 μ W

(d) 1 W.

Q43. The TRAP is one of the interrupts available in INTEL 8085. Which one of the following Statements is true of TRAP?

- (a) It is level triggered.
- (b) It is negative edge triggered.
- (c) It is positive edge triggered.
- (d) It is both positive edge triggered and level triggered.

Q44. A sine wave voltage has a peak value of 170. Its value at 260° will be

- (a) 85 V
- (b) 170 V
- (c) -85 V
- (d) -170 V

Q45. Which of the following crystallographic defects contribute to electronic defects?

1. Thermal vibration
2. Point defects
3. Line defects
4. Surface defects

Select the correct answer using the codes given below:

Codes:

- (a) 1,2 and 3
- (b) 2,3 and 4
- (c) 1,3 and 4
- (d) 1,2 and 4

Q46. The results of an open circuit test on a single phase transformer are

Voltage applied	:	:	100 V
Current Drawn	:	:	0.5 A
Power consumed	:	:	30 W

The corresponding reactance of the transformer is

- (a) 200 ohms

- (b) 250 ohms
- (c) 400 ohms
- (d) 500 ohms

Q47. An induction motor having full load torque of 60 Nm when delta-connected develops a starting torque of 120 Nm. For the same supply voltage, If the motor is changed to star-connection, the starting torque developed will be

- (a) 40 Nm
- (b) 60 Nm
- (c) 90 Nm
- (d) 120 Nm

Q48. Hysteresis motors are used for Hi-Q record players because of their

- (a) Constant (synchronous) speed
- (b) Extremely steady torque
- (c) Insensitivity to supply voltage fluctuations
- (d) Non- dependence on centrifugal switch requirement

Q49. If a synchronous motor fails to pull into synchronism after applying dc field current, the probable cause may be

- (a) High core losses
- (b) Low field current
- (c) High field current
- (d) Low short circuit ration.

Q50. A series motor is working drawing a load current of 1 ampere form the lines. If now the load is reduced such that the current drawn is halved, the speed of the machine (neglecting saturation and armature resistance) would be

- (a) Unchanged
- (b) Reduced by 50%
- (c) Reduced by100%
- (d) Increased by 100%

Solution

1:- (d)

$$\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s). \text{ Thus,}$$

$$I_{\infty} = \lim_{s \rightarrow 0} \frac{s(2s+10)}{s(s+2)}$$

$$= \lim_{s \rightarrow 0} \frac{2s+10}{s+2} = 5$$

2:- (a) 50%

3:- (a) The power density generated in dielectric heating is not proportional to capacitance. The frequency used in dielectric heating lies in the range of 1-50 MHz. In dielectric heating, non-uniform heating occurs for higher frequencies.

4:- (d) =

With connected,

=

= ==

=

=

Where, =

5:- (a)

G (s) =

Let the system be a unity feedback system.

Then the ch.eqn is:

$$S(s+2)(s+a) + k(s+10) = 0$$

$$\text{Or } s(s^2+s)(2+a) + ks+10k = 0$$

$$\text{Or } s^3 + s^2(2+a) + s(2a+k) + 10k = 0$$

s^3 1 (2k+k) second row constraints that a

s^2 (2+a) 10k the next row inform us that (2a+k) (2+a)

s^1 0 a and

s^0 10k 0 Smallest non-negative value of k= 0 a

Thus when a

(2+a) condition also is satisfied.

6:- (d) Disk capacity = 1000x5x17x512 Bytes

= 435x1000 Bytes

=42.5 MB.

7:- (c)

= ; =1+

= 1+

1+ = 1+

= 9

= = 3 mA/ V

8:- (b) the correct sequence of the operations which such a repeater performs is timing, equalization and decision making.

9:- (a) STC CY 1 1

CMC CY CY 0

MOV A, B A

10:- (d) All four temperatures will be identical.

11:- (b) The current density due to electrons in the valence band of a completely filled valence band is

= ne ()

Where n () is the sum of the velocity of all the electrons in this band, n is the number of electrons per unit volume and is the average drift velocity of electrons.

The total current density in a semiconductor or an insulator is the sum of the current density due to holes and the current density due to electrons. The electronic current is in a direction opposite to the hole current. The total current density J is obtained by the relation

$$J = J_h + J_e = (p e \mu_h + n e \mu_e)$$

Electrical Conductivity

$$I = 2e ()^{3/2} ()$$

For (Eg) (Eg)B

12:- (b) Disc type coils are used for high voltage winding.

13:- (c) It will cause negative sequence component current.

14:- (a) It is to reduce sparking at brushed.

15:- (c) The parameters are power factor and armature current.

16:- (b) In series parallel control, when the motors are in parallel,

Speed

(Series motors)

Since, is approximately equal to the applied Voltage V,

Speed

When the motor s are in series,

Speed

Thus speed in series arrangement is one fourth of the motors when in parallel.

17:- (a) Grounding is done in transmission line at the supply end.

18:- (b)

$$51. (b) \lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s) \text{ Then}$$
$$I_o = \lim_{s \rightarrow \infty} s \frac{s(2s+5)}{(s+1)(s+2)}$$

Dividing numerator and denominator by s^2 ,

$$I_o = \frac{2 + 5/s}{(1 + 1/s)(1 + 2/s)}$$
$$= \frac{2 + 0}{(1 + 0)(1 + 0)} = 2 \text{ A}$$

19:- (d)

20:- (c)

21:- (a) It is an elementary piece of knowledge. For Low resistance measurements, if circuit 2 is used, the ammeter resistance which may be comparable with the low resistance being measured gets added to the unknown and thereby causing larger error.

22:- (b) $G(s) =$

Since there is a pole in RHP of complex s-plane, the open loop system is unstable.

$$K(s+2) + (s+1)(s-7) = 0$$

$$\text{Or } s^2 + s(k-6) + (2k-7) = 0$$

s^2 1 (2k-7) It is seen that for k the first column of the

s^1 (k-6) 0 Routh table has all entries of the same sign; hence the

s^0 (2k-) 0 system is stable.

23:- (b) A relation is reflexive if every element of the set is related to itself. This is true; R includes

$(x,x), (y,y)$, and (z,z)

A relation is irreflexive, if, no element is related to itself. This is clearly untrue for R.

A relation is symmetric if, for any two distinct elements of the set, say, x and y, then if x is

related to y, y is related to x.

Now, since R contains (x, y) and also (y, x) , it may appear to be symmetric at first sight.

However, R also contains (y, z) but (z, y) is absent. We conclude that R not symmetric.

A relation is *Antisymmetry* if for any two distinct elements x and y , if x is related to y , y is not

related to x . We observe (x, y) and (y, x) present in R , so R is not *Antisymmetry*.

24:- (a) 10 ms.

25:- (d) Optical communication, radio communication, Telephony and Microwave communication.

26:- (c) $2^{12} = 4096$ 4 K

27:- (c) Glass rod.

28:- (b) Schrodinger equation is:

$$+ V\psi = E\psi$$

The wave vector ϕ governs the motion of electrons in the same way that light waves determine

that the motion of photons. In case of completely filled band, ϕ is zero, for the bound electrons are all

confined to a finite region. However the total velocity of all the electrons in the band is not necessarily zero.

29:- (d) Buchholz relay is a mechanical device that may be fitted to an oil immersed transformer. A breakdown of the insulation in a transformer is always accompanied by the generation of gas in the oil. A serious fault that will result in the rapid generation of this gas which tries to escape by way of the oil expansion chamber

30:- (c) Since torque is approximately proportional to voltage squared, when applied voltage reduces to 0.9 times, normal, the torque also reduces to $(0.9)^2 = 0.81$ times the normal torque. Hence, an approximate reduction of 20%

31:- (a) 1, 3 and 4 are correct,

32:- (c) When the unbalanced voltage is supplied.

33:- (c) For a multiplex winding the number of parallel paths is equal to $n \times p$, where n is 'flux' of winding and p is the number of poles.

34:- (c) The tension of the conductor decreases and its sag increases.

35:- (c) Then

$$1 = I(s) \cdot C = 1$$

$$I(s) = s.$$

$I(t)$ is a doublet

36:- (a) zero

37:- (d)

38:- (c) The error specified is always with respect to full scale reading and this is the maximum error that may be present at any deflection

$$\text{The \%} = \frac{150}{150} \times 100$$

$$= 2.0$$

39:- (d) A phase lag compensation will increase overshoot

40:- (b) Function of a modem is to convert digital data to analog signal and back.

41:- (c) A-3, B-4, C-1, D-2.

42:- (b) When power ratios are expressed in dBm, the reference power is 1mW.

43:- (d) It is both positive edge triggered and level triggered.

44:- (d) At 270° it will have negative peak value i.e., -170 V.

45:- (a) Choice (a) provides the better answer.

46:- (b) No load current = 0.5A = I_0 . No load current energy

$$= I_0 \cos \phi_0 = 0 = 0.3 \text{ A}$$

No load current magnetizing component

$$= =$$

Magnetizing reactance of transformer

$$X_m = 250 \text{ ohms.}$$

47:- (a) Now since the voltage across the winding reduces to $1/\sqrt{3}$ times the voltage when in delta

connection the torque becomes $(1/\sqrt{3})^2$ times, i.e., $1/3$ times.

Starting torque reduces to $120/3 = 40 \text{ Nm}$.

48:- (a) The more prominent reason is quiet operation and ability to start against large inertia. And ability to start against large inertia

49:- (b) The probable cause can be low field current.

50:- (d) Reduction in load will cause increase in speed.