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|  | INDIAN SPACE RESEARCH ORGANISATION | SET A |
| | Recruitment Entrance Test for Scientist/Engineer 'SC' - 2015 | |

1. The current I em units, flowing in a coil of a tangent galvanometer is given by the expression where
 r = Mean radius of the galvanometer coil.
 N = Number of turns of the galvanometer coil.
 H = Horizontal component of earth magnetic field.
 ϕ = Deflection of galvanometer magnetic needle.

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| (a) $I = (Hr / 2\pi N) * \text{Cos}\phi$ | (b) $I = (2\pi Nr / H) * \text{Tan}\phi$ |
| (c) $I = (Hr / 2\pi N) * \text{Tan}\phi$ | (d) $I = (2\pi Nr / H) * \text{Cos}\phi$ |

2. To measure current, Ammeters are connected in

| | |
|---------------------------------------|--|
| (a) Series with very low resistance | (b) Series with very High resistance |
| (c) Parallel with very low resistance | (d) Parallel with very High resistance |

3. If a circuit is formed consisting of two dissimilar metallic conductors, and if one of the junction has a temperature of T_1 and the other is at higher temperature T_2 , a current flow in the circuit. This effect is called as

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| (a) Petier Effect | (b) Thompson Effect |
| (c) Seeback Effect | (d) Ferrenti Effect |

4. Two wattmeter connected to measure the input of a balanced 3 Phase circuit indicates 2000 Watts and 500 Watts respectively. What will be the power factor of the circuit when both of the readings are positive?

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|-----------|-----------|
| (a) 0.800 | (b) 0.565 |
| (c) 0.750 | (d) 0.696 |

5. Wheatstone Bridge is used for measurement of

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|-----------------------------|--------------------------------|
| (a) Earth Resistance | (b) Very High Resistance value |
| (c) Medium Resistance Value | (d) Very Low resistance values |

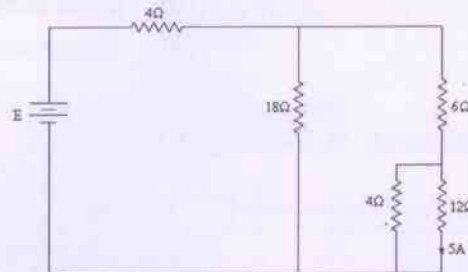
6. In a series RLC circuit, during resonance

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| (a) Inductive reactance becomes equal to capacitive reactance |
| (b) Only R becomes zero |
| (c) Only Capacitive reactance becomes zero |
| (d) Only Inductive reactance becomes zero |

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A**

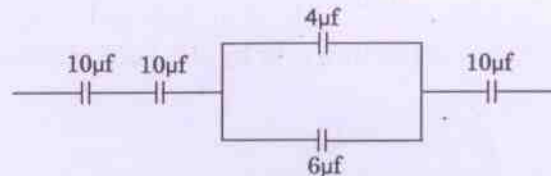
7. Which of the following network theorem deals with finding out the circuit values of voltage and current in a restricted portion of the network by replacing the actual source of energy by a single "equivalent voltage source" or by a single "equivalent current source" acting at a terminal pair?
- (a) Compensation Theorem (b) Norton's Theorem
(c) Substitute Theorem (d) Thevenin's Theorem
8. What will be the base impedance for a three phase system with base MVA = 100 MVA and Base kV as 11 kV?
- (a) 1.21 Ohms (b) 3.6 Ohms
(c) 5.2 Ohms (d) 2.78 Ohms
9. The differential protection relay may lose its stability for through faults due to saturation of CT magnetic circuit during short circuit condition. To overcome this difficulty which of the following technique is used
- (a) Biased differential relay
(b) Induction disc relay
(c) Stepped Tap changing method
(d) IDMTL Relay
10. During single phasing, the unbalanced stator current have a negative sequence component, which cause
- (a) Magnetic flux rotating in opposite direction to main flux
(b) Magnetic flux rotating in same direction to main field
(c) Increase the speed of the motor above synchronous speed
(d) Motor Starts rotating in Opposite direction
11. The Burden of protective Current Transformer (CT) is specified in
- (a) Percentage of load current (b) Percentage Ratio error
(c) Volt-Ampere (d) Percentage Phase Error

12. In the network shown in the figure below, the current in the 12 Ohm resistor is 5 Amps, the battery voltage E is



- (a) 120 Volts
(b) 180 Volts
(c) 300 Volts
(d) 310 Volts

13. What is the equivalent capacitance of the following circuit?



- (a) $2.5 \mu f$
(b) $40 \mu f$
(c) $32.4 \mu f$
(d) $4 \mu f$

14. The relation between the flux density (B) and Magnetic field intensity (H) is given by $B = \mu H$. What is μ in this relation?

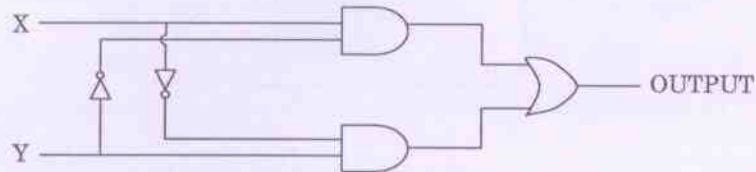
- (a) Magnetic susceptibility
(b) Dielectric constant
(c) Permeability of the medium
(d) Permittivity

15. Power supply to a 10 pole induction motor is supplied by 4 pole alternator which is driven at 1500 RPM. If the motor runs with slip of 4%, what is its speed?

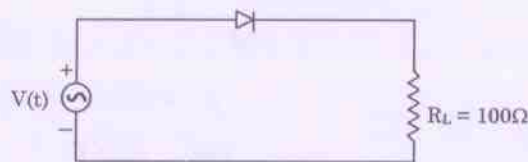
- (a) 750 RPM
(b) 576 RPM
(c) 600 RPM
(d) 240 RPM



16. A power factor meter connected in a circuit indicates pf of 0.6 lagging. To improve the power factor, we have to insert the following component in the circuit.
- (a) Inductors (b) Both inductor and resistors
(c) Capacitors (d) Resistors
17. The logic evaluated by the circuit at the output is



- (a) $X\bar{Y} + Y\bar{X}$ (b) $\bar{X}\bar{Y} + XY$
(c) $(\bar{X} + \bar{Y})XY$ (d) $\bar{X}Y + X\bar{Y} + X + Y$
18. The figure shows a half wave rectifier circuit with input voltage $v(t) = 10 \sin(100\pi t)$ volts. Assuming ideal diode characteristics with zero forward voltage drop and zero reverse current, the average power consumed in watts by the load resistance R_L is



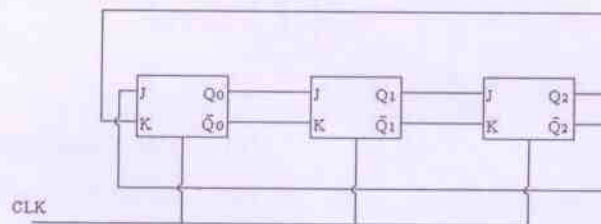
- (a) 1 Watts (b) 0.25 Watts
(c) Zero Watts (d) 0.5 Watts
19. The truth table

| X | Y | $F(x, y)$ |
|---|---|-----------|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

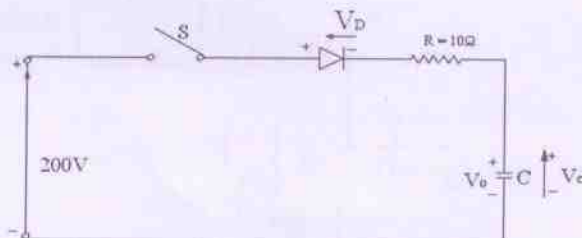
Represent the Boolean function

- (a) X (b) $X - Y$
(c) $X + Y$ (d) Y

20. A three stage Johnson counter ring in figure is clocked at a constant frequency of f_c from starting state of $Q_0 Q_1 Q_2 = 101$. The frequency of output $Q_0 Q_1 Q_2$ will be

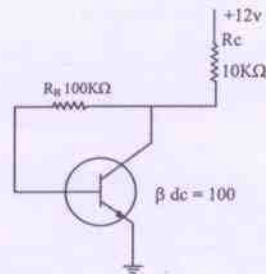


- (a) $f_c/2$ (b) $f_c/6$
 (c) $f_c/3$ (d) $f_c/8$
21. A 4 bit module - 16 ripple counter uses JK F/F. If the propagation delay of each F/F is 50 nano seconds, the maximum clock frequency that can be used is equal to
- (a) 20 MHz (b) 5 MHz
 (c) 10 MHz (d) 4 MHz
22. Figure shown below, capacitor C is initially charged to $V_0 = 50$ V with upper plate positive. Switch S is closed at $t = 0$. Current through the circuit at $t = 0$ and final voltage across C are respectively



- (a) 15 A, 200 V (b) 25 A, 250 V
 (c) 20 A, 200 V (d) 15 A, 150 V

23. The Q point value I_c for the circuit is



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| (a) 10.18 Micro Amps | (b) 102.5 Milli Amps |
| (c) 1.018 Milli Amps | (d) 6.325 Micro Amps |

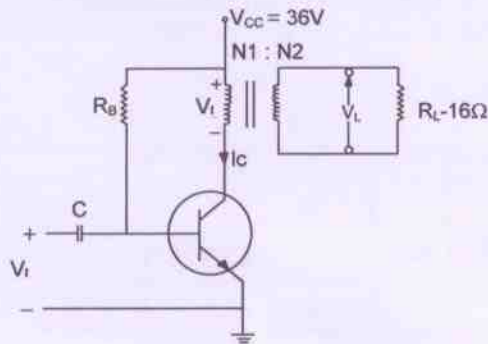
24. The frequency of oscillations of transistorized Colpitts Oscillator having tank circuit parameters $C_1 = 150$ pF, $C_2 = 1.5$ nf and $L = 50$ μ H is

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|---------------|--------------|
| (a) 500 kHz | (b) 3.26 MHz |
| (c) 1.927 MHz | (d) 63.5 kHz |

25. The following distortion readings are available for a power amplifier. $D_2 = 0.2$, $D_3 = 0.02$ and $vD_4 = 0.06$. The Total Harmonic Distortion (THD) is

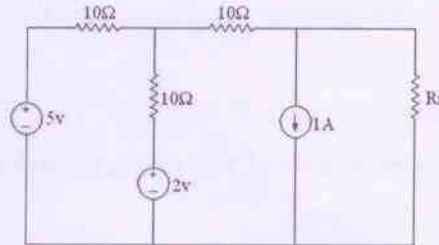
- | | |
|------------|------------|
| (a) 30.97% | (b) 20.97% |
| (c) 15.67% | (d) 13.29% |

26. A transformer coupled class A amplifier drives a 16 Ohm loud speaker through 4:1 transformer with $V_{cc} = 36$ V. If the circuit delivers 2 Watts to load, the rms voltage across the load assuming transformer efficiency as 100 % is



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| (a) 3.9 V | (b) 6.29 V |
| (c) 22.6 V | (d) 5.65 V |

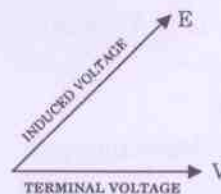
27. In the R_L circuit given below, the maximum power will be transferred when value of R_L is



- (a) 5 Ohms
(b) 15 Ohms
(c) 20 Ohms
(d) 25 Ohms
28. A source $V_s(t) = V \cos 100 \pi t$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load is connected to this source has to extract the maximum power out of the source, its value in Ohms should be
- (a) 3 Ohms
(b) 5 Ohms
(c) 4 Ohms
(d) 7 Ohms
29. In a transformer, exciting current is made up of two components namely magnetizing current I_M and core loss current I_c , with negligible leakage impedance drop (V is supply voltage)
- (a) Both I_M and I_c lag supply voltage V by 90°
(b) Both I_M and I_c are in phase with V
(c) I_M lags V by 90° whereas I_c is in phase with V
(d) I_M is in phase with V but I_c lags V by 90°
30. The leakage flux in a transformer depends upon
- (a) The applied input voltage
(b) Turns ration of transformers
(c) The load current
(d) The mutual flux
31. If Excitation of synchronous generator fails, it acts as a
- (a) Synchronous motor
(b) Induction motor
(c) Synchronous generator
(d) Induction generator



32. In a tap changer, the voltage at consumer terminals is kept within the prescribed limits by varying the
- Ratio of turns between primary and secondary windings
 - Frequency
 - Flux density in core
 - Angle between magnetic axis of the primary and secondary windings
33. The residual magnetism of a self excited DC generator is lost. To build up its emf what to be done to regain the residual magnetism?
- The field winding must be excited by double the rated DC voltage
 - The armature connection must be reversed
 - The field winding connection must be reversed
 - Field winding must be excited by low voltage DC supply
34. Two DC series machines are mechanically coupled. One machine is running as a motor and the other as a generator. The iron and friction loss will be identical when
- Their speeds are identical
 - Their speeds and excitation are identical
 - Their speeds are equal and back emfs are half of the supply voltage
 - Their excitations are equal and back emfs are half of the supply voltage
35. The phaser diagram of a synchronous machine connected to an infinite bus is shown below. The machine is

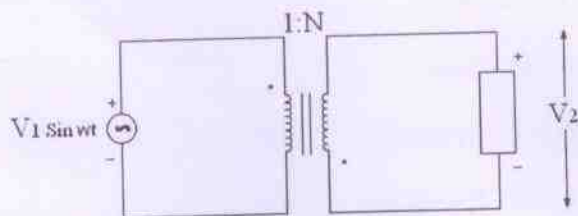


- Generator and operating at lagging pf
- Generator and operating at leading pf
- Motor and operating at a leading pf
- Motor and operating at a lagging pf



36. A 3 phase synchronous motor, connected to an infinite bus, operating at a leading pf with a constant load torque, if excitation is increased (δ is load angle and ϕ power factor angle)
- (a) Both δ and ϕ decreases
 - (b) δ and ϕ both increases
 - (c) δ increases but ϕ decreases
 - (d) δ decreases but ϕ Increases
37. Magnetizing inrush current in transformer is rich in
- (a) 3rd Harmonics
 - (b) 7th Harmonics
 - (c) 2nd Harmonics
 - (d) 5th Harmonics
38. Two Induction motors A and B are identical except that the air gap of motor 'A' is 50% greater than that of motor B then
- (a) The no-load pf of Motor A will be better than that of Motor B
 - (b) The no-load pf of Motor A will be poorer than that of Motor B
 - (c) The core losses of Motor A will be more than those of Motor B
 - (d) The operating flux of Motor A will be smaller than that of Motor B
39. A 3 phase induction motor draws active power P and reactive power Q from grid. If it is operating as a generator, P and Q will respectively be
- (a) Positive and negative
 - (b) Positive and positive
 - (c) Negative and negative
 - (d) Negative and positive
40. In case of 3 Phase Short circuit in a system, the power fed into the system is
- (a) Mostly active
 - (b) Mostly reactive
 - (c) Active only
 - (d) Active and reactive both


41. The output voltage of the ideal transformer with polarities and dots shown in the figure is given by



- (a) $(1/N) V_1 \sin(\omega t)$ (b) $(-1/N) V_1 \sin(\omega t)$
(c) $-N V_1 \sin(\omega t)$ (d) $-N V_1 \cos(\omega t)$
42. The average real power in watts delivered to a load impedance $Z_L = (4 - j2) \Omega$ by an ideal current source $i(t) = 4 \sin(\omega t + 20^\circ) A$ is
- (a) 78 Watts (b) 32 Watts
(c) Zero Watts (d) 64 Watts
43. A network contains B branches and N Nodes. The number of mesh current equations would be
- (a) $N - (B - 1)$ (b) $B - N - 1$
(c) $(B + N) - 1$ (d) $B - (N - 1)$
44. Superposition theorem is valid for
- (a) Linear circuits
(b) Non linear circuits
(c) Both linear and non linear circuits
(d) Circuits with active elements



45. A sine wave as has a peak value of 12 Volts. Its crest factor is
- (a) 1.732 (b) 1.11
(c) 1.415 (d) 0.706
46. A sinusoidal voltage $V = 50 \sin \omega t$ is applied to a series RL circuit. The current in the circuit is given by $I = 25 \sin(\omega t - 53^\circ)$. The apparent power consumed by the load is
- (a) 375 VA (b) 625 VA
(c) 2500 VA (d) 750 VA
47. A band pass filter is one which
- (a) Attenuates frequencies between two designated cut off frequencies and passes all other frequencies
(b) Passes all frequencies
(c) Attenuates all frequencies
(d) Passes frequencies between two designated cut off frequencies
48. A bulb in staircase has two switches, one switch being at the ground floor and the other being at first floor. The bulb can be turned ON and also OFF by any one of the switch irrespective of the state of the other switch. The logic of switching of bulb resembles
- (a) AND gate (b) XOR gate
(c) OR gate (d) NAND gate
49. Time domain expressions for the voltage $V_1(t)$ and $V_2(t)$ is given by
- $V_1(t) = V_m \sin(10t - 130^\circ)$ and
- $V_2(t) = V_m \cos(10t + 10^\circ)$ which is the correct statement
- The anticlockwise direction of rotation of phasor may be taken as positive.
- (a) $V_1(t)$ leads $V_2(t)$ by 130° (b) $V_1(t)$ lags $V_2(t)$ by 130°
(c) $V_1(t)$ lags $V_2(t)$ by -130° (d) $V_1(t)$ leads $V_2(t)$ by -130°

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50. In practice, earth is chosen as a place of zero electric potential because it
- is non conducting
 - is easily available reference
 - keeps losing and gaining electric charge everyday
 - has almost constant potential
51. Series compensation on EHV lines is resorted to
- Improve the stability
 - Reduce the fault level
 - Improve the voltage profile
 - As a substitute for synchronous phase modifier
52. The magnetic susceptibility of a specimen is small and positive, the specimen is
- Dia magnetic
 - Ferromagnetic
 - Paramagnetic
 - Non- magnetic
53. The rate of rise of restriking voltage depends upon
- The type of circuit breaker
 - Inductance of the system only
 - The capacitance of the system only
 - The inductance and capacitance of the system only
54. A Digital Volt Meter (DVM) uses 10 MHz clock and has a voltage controlled generator which provides a width of 5μ sec/volt of unit signal. A 10 V input signal would correspond to a pulse count of
- 500
 - 250
 - 750
 - 1000

