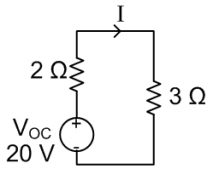
TS TRANSCO 2015

1. D

Milliman's theorem results in a single voltage source in series with an equivalent resistance or a single current source in parallel with an equivalent conductance.

2. C



When I = 0, V_{oc} = 20V

When R = 0 , I_{sc} = 10 A

The equivalent resistance, Re_{eq} = 20 /10 = 2Ω

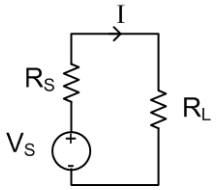
When R = 3Ω, $R_{total} = R_{eq} + R = 3 + 2 = 5\Omega$

From the equivalent circuit, $I = \frac{V_{oc}}{R_T} = \frac{20\ V}{5\ \Omega} = 4A$

3. B

$$P_{av} = \frac{V_m I_m}{2} \cos \omega t$$

4. C



For maximum power transfer $R_s = R_L = R$

From the circuit, $P_{input} = \frac{V_s^2}{2R}$

$$P_{output} = \frac{V_s^2}{4R}$$

$$\eta = \frac{P_{output}}{P_{input}} \times 100 = 50\%$$

5. A

Maximum real power is transferred from source to load, when load impedance is complex conjugate of source impedance

6. A

$M \leq K\sqrt{L_1 L_2} = 0.6 \times \sqrt{0.4 \times 2.5} = 0.6$ H

7. C

Required output from a DC machine is DC which can be collected from the armature. So armature should be placed on the rotor so that commutation action (ac to dc or dc to ac) takes place.

8. D

9. D

10. C

11. B

In synchronous generator field axis leads the armature flux axis. In synchronous motor field axis lags the armature flux axis.

12. B

In induction motor $T \alpha V^2$ and $V \alpha B_{max}$

13. B

14. A

Static Shielding is also termed as Guard Ring. This method uses a large metal ring surrounding the bottom insulator unit and connected to the line. This ring is called a grading or guard ring which gives a capacitance which will cancel the charging current of ground capacitance. It's function is to evenly-distribute the potential gradient across the length of the insulator string.

15. B

16. A

17. D

18. D

19. A

$T = \frac{1}{200} = 5$ ms ; $T_{OFF} = 4$ ms ; $T_{ON} = 5\text{-}4 = 1$ms

Duty cycle $\delta = \frac{T_{ON}}{T} = \frac{1}{5}$

Average resistance in the rotor circuit = $(1- \delta)x6 + 2 = \frac{26}{5}\ \Omega$

20. B

Economizer is a heat-exchanger between air-pre-heater & primary super heater. In economizer counter flow occur between flue-gas & high-pressure water, because of counter flow maximum heat transfer will occur. Generally 40 to 60 degree of High-pressure water will increase. To increase the temperature of High pressure water upto 40 Degree Celsius we need extra huge amount of coal to burn. So we are using the waste flue gas to heat the water, means we are saving/economizing extra coal usage.

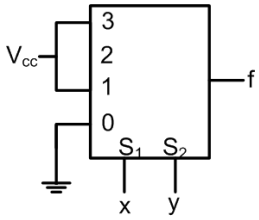
21. D

P.U current ripple increases up to $\alpha = 0.5$ and then decreases.

22. C

Minimum number of any one type gates required are 3.

23. B



x	Y	F
0	0	1
0	1	1
1	0	0
1	1	1

$$f = \bar{x}\,\bar{y} + \bar{x}\,y + xy = \bar{x}\,(y + \bar{y}) + xy = \bar{x} + xy$$

24. A

If $V_{GS} > V_{Th}$, MOSFET is turned ON

25. A

$$\text{CMRR} = \frac{A_d}{A_c}$$

26. D

1 0 1 0 1 1

1 1 1 1 1 0

Gray code is a cyclic code

27. B

$T_d \alpha \theta$

28. C

29. A

In order to measure reactive power in 3-φ phase circuit a compensated wattmeter is used. In this wattmeter the voltage applied to the pressure coil is 90° out of phase with the actual voltage and hence it will read VI cos (90° – ϕ) i.e., VI sin ϕ reactive power.

30. B

31. C

In liquid fuse carbon tetra chloride is used for arc extinction. Liquid type HRC fuse consists of a carbon tetra chloride filled glass tube sealed at both ends with brass caps.

32. A

33. C

34. C

Surge Capacitor is a Device that absorbs surge and holds it for few seconds and then releases it to the system. Although it absorbs high voltage surge but it can't absorb or hold very high current surge. **Surge Arrester** is a device that bypass, when applied on it, high voltage/Current surge to the ground. Surge capacitor with (in series) surge arrester are used to protect sophisticated electrical devices.

35. B

The inrush current of a T/F is maximum when the source voltage is switched ON at zero voltage value and is minimum when supply voltage is switched ON at maximum voltage value.

36. B

37. C

Line losses do not affect stability of the power system.

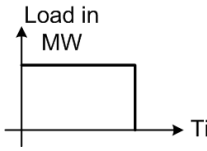
38. B

39. B

A heliostat (from helios, the Greek word for sun, and stat, as in stationary) is a device that includes a mirror, usually a plane mirror, which turns so as to keep reflecting sunlight toward a predetermined target, compensating for the sun's apparent motions in the sky.

40. C

41. A



Load factor = $\frac{\text{Average demand}}{\text{maximum demand}}$

For L.F =1, A.D = M.D

42. A

Diversity Factor is ratio of the sum of the individual maximum demands of the various sub circuit of a system to the maximum demand of the whole system.

Diversity Factor = Installed load / Running load.

Diversity Factor is always >1 because sum of individual max. Demands > Max. Demand. Greater the diversity factor, lesser is the cost of generation of power.

43. A

In a parallel RLC circuit as the total susceptance is zero at the resonant frequency, the admittance is at its minimum and is equal to the conductance, G. Therefore at resonance the current flowing

through the circuit must also be at its minimum as the inductive and capacitive branch currents are equal and are 180^{o} out of phase.

44. C

45. B

Due to skin effect most of the current is confined to outer layer conductor i.e near the surface of the conductor

46. A

47. A

48. D

49. D

When non conducting parts such as wood, plastics, bones are subjected to an alternative electrostatic field dielectric loss occur. In dielectric heating use of these losses in made.

50. A

Spot welding is typically used when welding particular types of sheet metal, welded wire mesh or wire mesh. Thicker stock is more difficult to spot weld because the heat flows into the surrounding metal more easily.

51. D

Constant current power supplies are most often used for manual welding processes such as gas tungsten arc welding and shielded metal arc welding, because they maintain a relatively constant current even as the voltage varies. As Manual metal arc welding requires a high current (50-300A) but a relatively low voltage (10-50V), high voltage mains supply (240 or 440V) must be reduced by a transformer.

52. C

53. C

Gain = $\frac{1}{\text{Gain margin}}$

54. C

55. C & D

56. C

Two fully controlled converters are connected back to back for four quadrant operation

57. A

Relaxation oscillator produce non sinusoidal waveforms

58. C

59. C

60. B

61. A

Voltage of battery = n × V

Capacity of battery = K

When cells are connected in series the total voltage across terminals is sum of all the voltages and the total rating is slightly increased than the rating of single cell.

62. B

The load angle or torque angle is the angle between stator & rotor fluxes. The rotating stator flux always leads rotor flux vector by this angle. Torque induced = |stator flux| × |rotor flux| × sin δ rotor & stator fluxes being constant, so torque depends directly on this load angle. It is also the angle between induced emf & terminal voltage in a 3-phase alternator. It is a function of load & increases as the load increases. This angle decides the real power flow from an alternator.

63. A

Power output from the generator = $\frac{EV}{X_s}\sin\theta$. Steady state power limit is the maximum power that can be transferred without losing synchronism. At $\theta = \frac{\pi}{2}$, $P_o = P_{max}$ and

$$P_{max} = \frac{EV}{X_s}$$

64. A

$$\text{Undamped frequency of oscillations} = \sqrt{\frac{P_r}{M}}$$

65. B

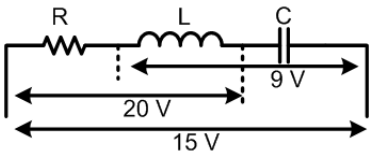
S^4	1	10	5
S^3	2	20	0
S^2	ε	5	0
S^1	$\frac{20\varepsilon - 10}{\varepsilon}$	0	
S^0	5		

66. A

The negative relays are also called phase unbalance relays because these relays provide protection against negative sequence component of unbalanced currents existing due to unbalanced loads or phase-phase faults. They are generally used to give protection to generators and motors against unbalanced currents.

67. C

68. A



$V_L - V_c = 9$ V and $\sqrt{V_R^2 + V_L^2} = 20$ V

$V_s^2 = \sqrt{V_R^2 + (V_L - V_C)^2} \Rightarrow 15^2 = \sqrt{V_R^2 + 9^2} \Rightarrow V_R = 12$ V

$\sqrt{12^2 + V_L^2} = 20 \Rightarrow V_L = 16$ V

$V_C = V_L - 9 = 16 - 9 = 7$ V

69. C

High torque is obtained with DC series motor.

70. B

During the arcing period, the current flowing between the contacts depends upon the arc resistance. The greater the arc resistance, the smaller the current that flows between the contacts. The arc resistance depends upon Degree of ionization, Length of the arc and Cross-section of arc

71. B

Closed loop T/F = $\frac{9}{s^2+s+9}$

Comparing it with second order standard system $\frac{\omega_n^2}{s^2+2\xi\omega_n s+\omega_n^2}$

$\omega_n = 3$ & $2\xi\omega_n = 1$

$\varepsilon = \frac{1}{6} = 0.3$

72. C

$\text{Power} = 0.5 \times \text{Swept Area}(m^2) \times \text{Air Density}(kg/m^3) \times \text{Velocity}^3(m/s)$ watts or J/sec

73. B

An integral controller output is directly proportional to the integration of the error signal. Integral controller is also known as reset controller.

74. B

$V_{\text{at max.power point}} = 0.75$ to 0.9 times of V_{OC} and $I_{\text{at max.power point}} = 0.85$ to 0.95 times of I_{SC}

75. A

$$\frac{C(s)}{R(S)} = \frac{1}{1+s} = \frac{1}{s\left(\frac{1}{s}+1\right)}$$

C(∞) for unit step input =

$$\lim_{s\to\infty} s\frac{1}{s\left(\frac{1}{s}+1\right)} = 1$$

76. C

When the solar cell is operated at open circuit, I = 0 and the voltage across the output terminals is defined as the open-circuit voltage. Assuming the shunt resistance is high enough to neglect the final term of the characteristic equation, the open-circuit voltage V_{OC} is:

$$V_{OC} \approx \frac{nkT}{q} \ln\left(\frac{I_L}{I_O}+1\right)$$

when the cell is operated at short circuit, V = 0 and the current I through the terminals is defined as the short-circuit current. It can be shown that for a high-quality solar cell (low R_S and I_0, and high R_{SH}) the short-circuit current $I_{SC} \approx I_L$.

77. B

If f is reduced, synchronous speed N_s is reduces. But $(N_s - N) \alpha S$

78. C

$$A_{OL} = 120, \beta = 0.1$$

$$A_{CL} = \frac{A_{OL}}{1 + A_{OL}\beta} = \frac{120}{1 + 120 \times 0.1} = 9.23$$

79. B

A time base generator, or time base or sweep generator, is a special type of function generator, an electronic circuit that generates a varying voltage to produce a particular waveform. Time base generators produce very high frequency sawtooth waves specifically designed to deflect the beam in cathode ray tube (CRT) smoothly across the face of the tube and then return it to its starting position.

80. C

When $\xi = 1$, the system is said to be critically damped

81. B

82. C

83. C

84. C

85. B

86. D

87. D

88. C

89. B

90. A

91. A

92. D

93. C

Let present age of A = x + 9 and age of B = x

X + 9 + 10 = (X-10) x 2 => x = 39 years

94. C

Let the side of a square be 'a' and its area is a^2

Change in side is 25% means that area is $\frac{25}{16}\ a^2$

Change in area = $\frac{25}{16}a^2 - a^2 = \frac{9}{16}a^2$

% change = $\frac{9}{16}x100 = 56.25\%$

95. C

Total cost of the mixture = 2x50 +4x20 + 3x20 = 270 rupees

Cost per KG = $\frac{270}{2+4+3}$ = 30 rupees

Percentage profit = $\frac{33-30}{30}x100 = 10\%$

96. B

Average velocity = $\frac{2v_1v_2}{v_1+v_2} = \frac{2x21x24}{45} = \frac{112}{5}$ km/hr

Total distance covered $S=V_{av}$ x t = $\frac{112}{5}x10 = 224$ km

97. C

98. D

99. B

100.C