120114

Paper Code No. : M-47

M – 47

Question Booklet No. : .....

ENTRANCE EXAMINATION – 2020-21

SET - B

ROLL NO : M 4 7 12 11 4

Signature of Invigilator

Time : 1 HOUR 30 MINUTES

Total Marks : 100

Instructions to Candidates

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET, the OMR sheet will be cancelled, and will not be evaluated.
2. **This Question Booklet contains the cover page and a total of 100 Multiple Choice Questions of 1 mark each.**
3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.
4. There is negative marking in Multiple Choice Questions. For each wrong answer, 0.25 marks will be deducted.
5. USE/POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, iPhone, iPad, page ETC. is strictly PROHIBITED.
6. Candidate should check the serial order of questions at the beginning of the test. If any question is found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.
7. Answers must be marked in the OMR response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.
8. The OMR response sheet should not be folded or wrinkled. The folded or wrinkled OMR/Response Sheet will not be evaluated.
9. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.
10. There are four options to each question marked A, B, C and D. Select one of the most appropriate options and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

CORRECT METHOD
(A) ● (C) (D)

WRONG METHOD					
(A) (B) (C) (D)	(A) (B) (C) (D)	● (B) (C) (D)	(A) ● (C) (D)	(A) ● (C) (D)	● (B) (C) ●

ENTRANCE EXAMINATION – 2020-21

Paper Code No. : M–47

SET - B

1. Let $f_1(z) = z^2$ and $f_2(z) = \bar{z}$ be two complex variable functions. Here $\bar{z}$ is the complex conjugate of z. Choose the correct answer.

   A. Both $f1(z)$ and $f2(z)$ are analytic

   B. Only $f1(z)$ is analytic

   C. Only $f2(z)$ is analytic

   D. Both $f1(z)$ and $f2(z)$ are not analytic

2. The Laplace transform of the first derivative of a function f (t) is

   A. F(s)/s

   B. SF(s) – f(0)

   C. F(s) – f (0)

   D. f (0)

3. Considering the root locus diagram for a system with

   $G(S) = K(S + 5) / S(S + 2)(S + 4)(S^2 + 2S + 2)$, the meeting point of the asymptotes on the real axis occurs at

   A. –1.2

   B. –0.85

   C. –1.05

   D. –0.75

4. An input $(t) = \sin(t)$ is applied to the system $G(s) = \dfrac{(S-1)}{(S+1)}$. The corresponding steady state output is $y(t) = \sin(t + \varphi)$, where the phase φ (in degrees), when restricted to $0° \le \varphi \le 360°$, is

   A. 90 or –270

   B. 180

   C. –180

   D. 360

5. Consider the transfer function $(s) = \dfrac{2}{(S+1)(S+2)}$. The phase margin of $G(s)$ in degrees is

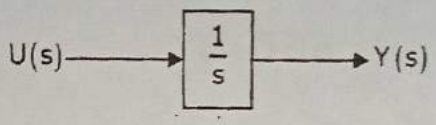
   A. 180 or –180

   B. 90 or –90

   C. 270 or –270

   D. 360 or –360

6. Assuming zero initial condition, the response y (t) of the system given below to a unit step input u(t) is



A. u (t)

B. T u(t)

C. $\frac{t^2}{2}$ u(t

D. e^{-t} u (t)

7. Whether a linear system is stable or unstable that it

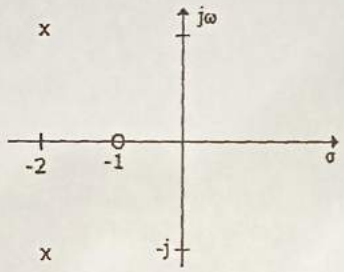
A. is a property of the system only

B. depends on the input function only

C. both (a) and (b)

D. either (a) or (b)

8. In the given figure shows pole-zero plot. If steady state gain is 2, the transfer function G(s) is



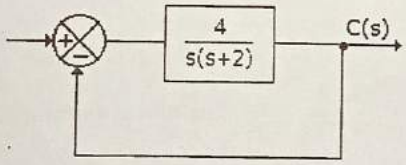
A. $\frac{2(s+1)}{s^2+4s+5}$

B. $\frac{5(s+1)}{s^2+4s+4}$

C. $\frac{10(s+1)}{s^2+4s+3}$

D. $\frac{10(s+1)}{(s+2)^2}$

9. For the system of the given figure, the damping ratio of closed loop poles is



A. 1.5

B. 1.0

C. 0.5

D. 0.25

10. The value of a_0 which will ensure that the polynomial $(S^3 + 3S^2 + 2S + a_0)$ has roots on the left half of the s-plane is

A. 11

B. 9

C. 7

D. 5

11. For a first order system having transfer function of $\frac{1}{(1+sT)}$, the unit impulse response is

A. $e^{-t/T}$

B. $Te^{-t/T}$

C. $\left(\frac{1}{T}\right)e^{-t/T}$

$T^2 e^{-t/T}$

12. Time domain expressions for the voltage are given as $v_1(t) = V_m \sin(10t - 130°)$ and $v_2(t) = V_m \cos(10t + 10°)$

Which one of the following statements is TRUE?

A. v_1 (t) lead 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°

13. The impulses response of an LTI system is given as:

$$= \begin{cases} \frac{\omega_c}{\pi} & n = 0 \\ \frac{\sin \omega_c n}{\pi n} & n \neq 0 \end{cases}$$

It represents an ideal

A. non-causal, low-pass filter

B. causal, low-pass filter

C. non-causal, high-pass filter

D. causal, high-pass filter

14. A discrete-time signal x[n] is obtained by sampling an analog signal at 10 kHz. The signal x [n] is filtered by a system with impulse response h [n] = 0.5{δ [n] + δ [n – 1]}. The 3dB cutoff frequency of the filter is:

A. 1.25 kHz

B. 2.50 kHz

C. 4.00 kHz

D. 5.00 kHz

15. If the Nyquist plot of the loop transfer function G(s) H(s) of a closed-loop system encloses the (−1, j0) point in the G(s)H(s) plane, the gain margin of the system is

A. zero
B. greater than zero
C. less than zero
D. infinity

16. Given a unity feedback control system with $G(s) = \frac{k}{s(s+4)}$, the value of k for a damping ratio of 0.5 is

A. 1
B. 16
C. 32
D. 64

17. The discrete-time transfer function $\frac{(1-2Z^{-1})}{(1-0.5Z^{-1})}$ is

A. Non-minimum phase and unstable
B. Minimum phase and unstable
C. Minimum phase and stable
D. Non-minimum phase and stable

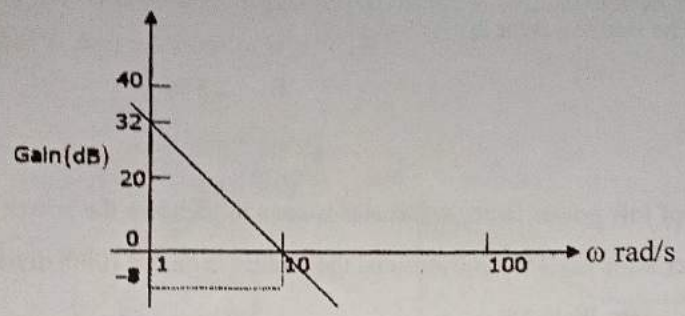
18. When a unit step voltage drives a LAG network, the output

A. remains constant at unit step value
B. increases exponentially from zero to final value
C. decreases exponentially from 1 to 0
D. decreases exponentially from 1 to −1

19. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is

A. Stable
B. Unstable
C. Limitedly stable
D. Limitedly unstable

20. The Bode plot of a transfer function G(s) is shown in the figure below.



The gain (20 log G(s)) is 32dB and – 8dB at 1 rad/s and 10 rad/s respectively. The phase is negative for all ω . Then G(s) is

A. $39.8 / s$
B. $39.8 / s^2$
C. $32 / s$
D. $32 / s^2$

21. The difference between the indicated value and the true value of a quantity is

A. Gross Error
B. Absolute Error
C. Dynamic Error
D. Relative Error

22. Resistance R_1 and R_2 have respectively nominal values of 10 Ω and 5 Ω and tolerance of ± 5% and ± 10%. The range of values for the parallel combination of R_1 and R_2 is

A. 3.077 Ω to 3.636 Ω
B. 2.805 Ω to 3.371 Ω
C. 3.237 Ω to 3.678 Ω
D. 3.192 Ω to 3.435 Ω

23. A PMMC zero to 10 A ammeter is not provided with any controlling mechanism and the moving parts are free to rotate. If a current of 1 A dc is passed through the moving coil, then the instrument

A. will read 1 A
B. will read 10 A
C. pointer will continuously rotate
D. pointer will remain stationary

24. An ammeter of 0-25 A range has a guaranteed accuracy of 1% of full scale reading. The current measured is 5 A. The limiting error is

A. 2 %
B. 2.5 %
C. 4%
D. 5%

25. A 300 V, 5A, 0.2 pf low power factor wattmeter is used to measure the power consumed by a load. The wattmeter scale has 150 divisions and the pointer is on the 100th division. The power consumed by the load (in Watts) is

A. 200
B. 500
C. 750
D. 1000

26. A single phase energy meter has the rating 1200 resolutions/ kWh. If a 500 W electric gadget is used for 4 hours, the energy meter will make

A. 1200 revolutions
B. 1800 revolutions
C. 2100 revolutions
D. 2400 revolutions

27. In which of the transformer is the secondary nearly short circuited under normal operating conditions?

A. Current transformer (CT)
B. Potential transformer (PT)
C. Distribution transformer
D. Power transformer

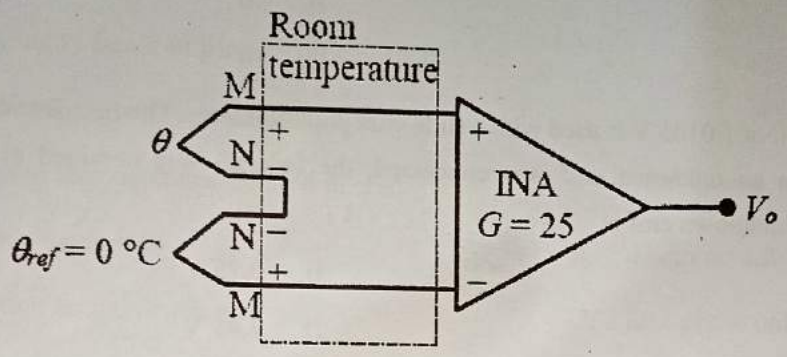
28. A piezoelectric force transducer has a charge sensitivity of 20 pC/N. It is connected to a charge amplifier and overall gain of transducer and amplifier is 50 mV/N. The gain of amplifier is

A. 1 mV/pC
B. 1.5 mV/pC
C. 2.5 mV/pC
D. 4 mV/pC

29. An LVDT is used to measure displacement. The LVDT feeds a Voltmeter of 0-5 V range through a 250 gain amplifier. For a displacement 0.5 mm the output of LVDT is 2 mV. The sensitivity of instrument is

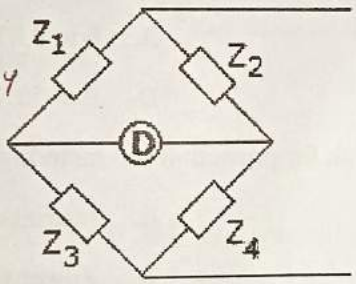
A. 0.1 V/mm
B. 0.5 V/mm
C. 1 V/mm
D. 5 V/mm

30. As shown in the figure, temperature θ is measured using a K type thermocouple. It has a sensitivity of 40 μ V/°C. The gain (G) of the ideal instrumentation amplifier is 25. If the output V_0 is 96 mV, then the value of θ(in °C) is



A. 95-97
B. 25-27
C. 45-47
D. 65-67

31. In figure, $Z_1 = 200 \angle 60° \Omega$, $Z_2 = 400 \angle -90° \Omega$, $Z_3 = 300 \angle 0°$. Then Z_4 for bridge to be balanced is



A. $150 \angle 30° \Omega$
B. $400 \angle -90° \Omega$
C. $300 \angle 90° \Omega$
D. $600 \angle -150° \Omega$

32. In a strain measuring device using a strain gauge, the output quantity is

A. voltage
B. resistance
C. impedance
D. either (a) or (b)

33. A coil is tested with a series type Q-meter. Resonance at a particular frequency is obtained with a capacitance of 110 pF. When the frequency is doubled, the capacitance required for resonance is 20 pF. The distributed capacitance of the coil in **pico farad** is

A. 40
B. 30
C. 20
D. 10

34. A standard cell of 1.0185 V is used with a slide wire potentiometer. The balance was obtained at 60 cm. When an unknown emf was connected, the balance was obtained at 82 cm. The magnitude of unknown emf is

A. 1.39 V
B. 0.75 V
C. 13.9 V
D. 7.45 V

35. A moving coil instrument has a resistance of 0.5 Ω and a full scale deflection of 0.1 A. To convert it into an ammeter of 0-10 A, the shunt resistance should be

A. 0.004 Ω
B. 0.005 Ω
C. 0.05 Ω
D. 0.1 Ω

36. An accelerometer has input range of 0-10 g, natural frequency 30Hz and mass 0.001 kg. The range of the secondary displacement transducer in mm required to cover the input range is

A. 0 to 2.76
B. 0 to 9.81
C. 0 to 11.20
D. 0 to 52.10

37. Which of the following are needed both for protection and metering?

A. Wattmeters
B. Instrument transformers
C. Energy meters
D. Power factor meters

38. Which of the following statement is correct for two wattmeter method of power measurement in 3 phase circuit?

A. Power can be measured by this method only for star connected loads
B. When two wattmeters have equal readings power factor is 0.5.
C. When power factor is 1, one of the wattmeters readings is zero
D. When the two wattmeter read equal and opposite, p.f. is zero.

39. A Q meter is best suited for the measurement of the .....

A. Quality factor of a capacitance.

B. Distributed capacitance of a coil.

C. Quality factor of piezoelectric sensor.

D. Turns-ratio of a transformer.

40. Induction wattmeter can be used in

A. ac circuit only

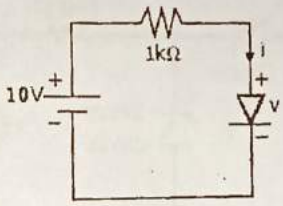
B. dc circuit only

C. both ac and dc circuit

D. ac 3 phase only

41. The i-v characteristics of the diode in the circuit given below are:

$$i = \begin{cases} \dfrac{v - 0.7}{500} A, & v \geq 0.7V \\ 0A, & v < 0.7V \end{cases}$$



The current in the circuit is :

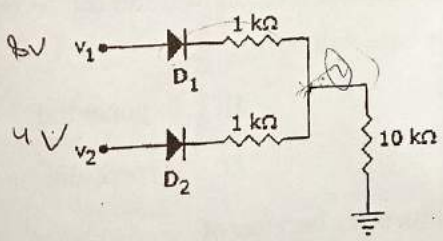
A. 10 mA

B. 9.3 mA

C. 6.67 mA

D. 6.2 mA

42. In figure $v_1 = 8$ V and $v_2 = 4$ V. Which diode will conduct?



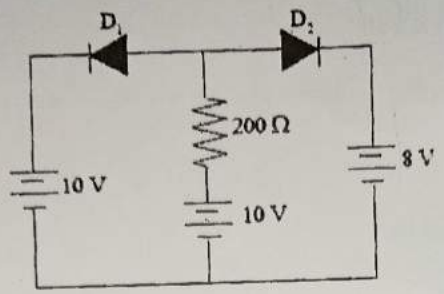
A. D_2 only

B. D_1 only

C. Both D_1 and D_2

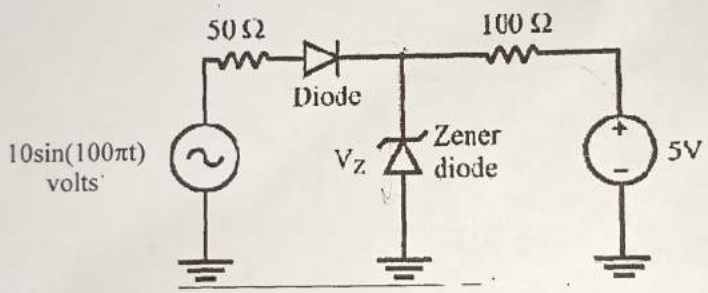
D. Neither D_1 nor D_2

43. For the circuit shown in the figure assume ideal diodes with zero forward resistance and zero forward voltage drop. The current through the diode D_2 in mA is



A. 40 mA
B. 30 mA
C. 20 mA
D. 10 mA

44. If the diodes in the circuit shown are ideal and the breakdown voltage V_z of the Zener diode is 5 V, the power dissipated in the 100 Ω resistor (in watts) is



A. 0
B. 1
C. 25 / 100
D. 225 / 100

45. In an n-p-n transistor biased in the active region, if recombination can be neglected in the p-type base, the excess electron density in the base will be

A. Linear
B. Exponential
C. Quadratic
D. Hyperbolic

46. The current of a BJT drops at high frequencies because of

A. the early effect
B. transistor capacitances
C. high current effect in the base
D. Parasitic inductive elements

47. In the saturation region, the JFET transfer characteristics are:

A. Exponential
B. Linear
C. Parabolic
D. Hyperbolic

48. The noise level in FET is

A. More than BJT
B. Negligibly small
C. Slightly less than BJT
D. None of these

49. For $V_{GS} = 0$ V, the drain current becomes constant when V_{DS} exceeds

A. Cutoff
B. V_{DD}
C. V_P
D. 0 V

50. Voltage-shunt feedback is appropriate for a:

A. Transconductance Amplifier
B. Transresistance Amplifier
C. Current Amplifier Amplifier
D. Voltage

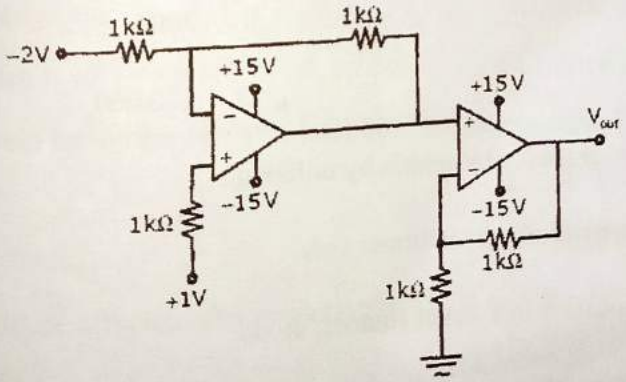
51. An amplifier has a large ac input signal. The clipping occurs on both the peaks. The output voltage will be nearly a

A. sine wave
B. square wave
C. triangular wave
D. cosine wave

52. The self-bias of BJT provides

A. stable Q point
B. large voltage gain
C. high input impedance
D. high base current

53. In the circuit shown below the op—amps are ideal. Then V_{out} in volts is



A. 4
B. 6
C. 8
D. 10

54. Negative feedback enhances all performances parameters of an amplifier excepts its

A. Gain

B. 3-dB frequency

C. Noise figure

D. Input impedance

55. Real life implementations of high-pass active filters turn out actually to be:

A. Band pass filter

B. Band-reject filter

C. Intergrators with a high cutoff frequency

D. A combination of band pass and band-reject filter

56. Which of the following oscillators is suitable for frequencies in the range of Mega-hertz (MHz)?

A. RC phase shift

B. Wien bridge

C. Hartley

D. Both (a) and (c)

57. The most realistic value for open-loop gain of an OP-AMP is

A. 1

B. 2000

C. 80 dB

D. 100,000

58. A Schmitt trigger circuit achieves hysteresis by utilizing :

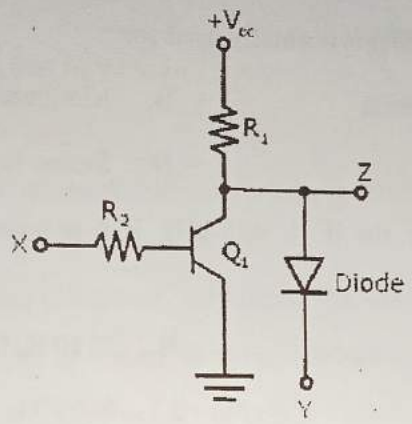
A. The magnetic properties of a transformer core

B. Avalanche multiplication in a Zener (tunnel) diode

C. The Barkhausen principle

D. Regenerative positive feedback

59. In the circuit shown below, Q_1 has negligible collector—to—emitter saturation voltage and the diode drops negligible voltage across if under forward bias. If V_{CC} is + 5V , X and Y are digital signals with 0 V as logic 0 and V_{CC} as logic 1, then the Boolean expression for Z is



z)?

A. XY
B. $\overline{X}Y$
C. $X\overline{Y}$
D. $\overline{XY}$

60. The number of comparators required for implementing an 8-bit flash analog-to-digital converter (ADC) is

A. 8
B. 128
C. 255
D. 256

61. The fastest digital to analog converter (DAC) is

A. Comparator type
B. Counter type
C. Successive type
D. Dual slope type

62. What RST could be for the TRAP in Intel 8085 Microprocessor ?

A. RST 6.5
B. RST 7.5
C. RST 5.5
D. RST 4.5

63. Which flag will be affected after execution of DAD register pair (rp) instruction of Intel 8085 Microprocessor ?

A. Only CARRY flag
B. Only PARITY flag
C. Only ZERO flag
D. All flags

64. The most commonly used filters in SSB generation are :

A. Mechanical
B. LC
C. RC
D. Low- pass

65. Vestigial sideband modulation (VSB) is normally used for :

A. HF point to point communication
B. Monaural broadcasting
C. TV broadcasting
D. Stereo broadcasting

66. In a superheterodynetype receiver, the IF is 455 kHz. If it is tuned to 1200 kHz, the image frequency will be

A. 1655 KHz
B. 2110 KHz
C. 745 KHz
D. 910 KHz

67. A full duplex binary FSK transmission is made through a channel of bandwidth 10 kHz. In each direction of transmission the two carriers used for the two states are separated by 2 kHz. The maximum baud rate for this transmission is:

A. 2000 bps
B. 3000 bps
C. 5000 bps
D. 10000 bps

68. A maximally flat frequency response is known as

A. Chebyshev
B. Butterworth
C. Bessel
D. Colpitts

69. Which power amplifier can deliver maximum load power?

A. Class A
B. Class AB
C. Class B
D. Class C

70. A thyristor has a maximum allowable junction temperature of 120°C and the ambient temperature is 40°C. If thermal resistance is 1.6° C/W, the maximum allowable internal power dissipation in Watts is

A. 20
B. 50
C. 92
D. 128

71. An SCR is triggered at 40° in the positive half cycle only. The average anode current is 50 A. If the firing angle is changed to 80°, the average anode current is likely to be

A. 50A

B. 25A

C. less than 50 A but more than 25 A

D. less than 25 A

72. When thyristors are connected in parallel, the current distribution may become non-uniform due to

A. inductive effect of current carrying conductors

B. capacitive effect of current carrying conductors

C. both inductive and capacitive effects

D. none of the above

73. A 3 kV circuit uses SCR of 800 V rating. If derating is 25%, the number of SCRs in series is

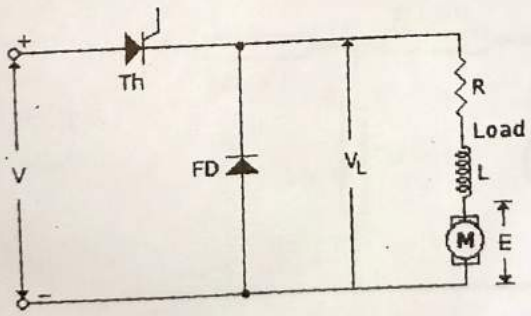
A. 4

B. 5

C. 6

D. 8

74. Figure shows a chopper feeding RLE load, The free-wheeling diode conducts when



A. thyristor is on

B. thyristor is off

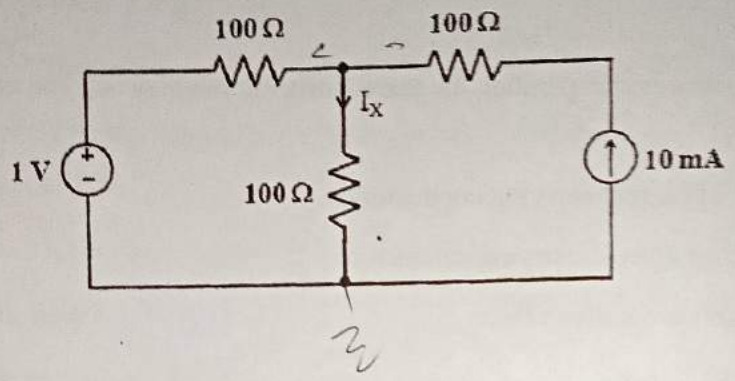
C. both when thyristor is on and thyristor is off

D. partly when thyristor is off and partly when thyristor is on

75. A single phase cycloconverter with centre tapped input transformer requires

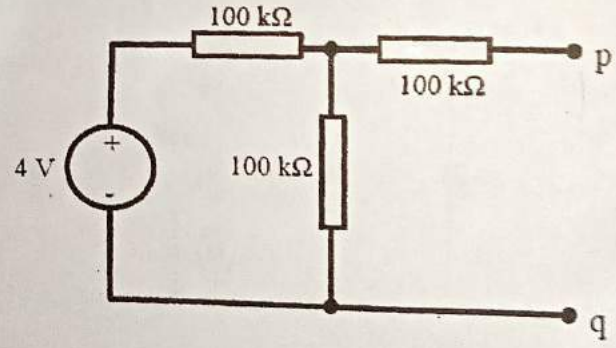
A. 2 thyristors
B. 4 thyristors
C. 8 thyristors
D. 10 thyristors

76. The current I_X in the circuit given below in milliampere is



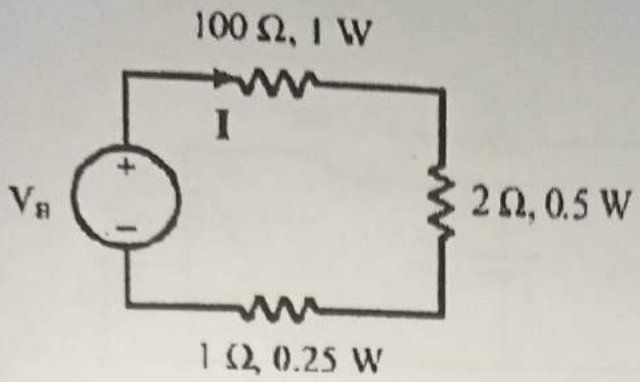
A. 5
B. 10
C. 15
D. 20

77. The Thevenin equivalent circuit representation across terminals p-q of the circuit shown in the figure is a



A. 1 V source in series with 150 k Ω
B. 1 V source in parallel with 100 k Ω
C. 2 V source in series with 150 k Ω
D. 2 V source in parallel with 200 k Ω

78. In the circuit show below, the safe maximum value for the current I is



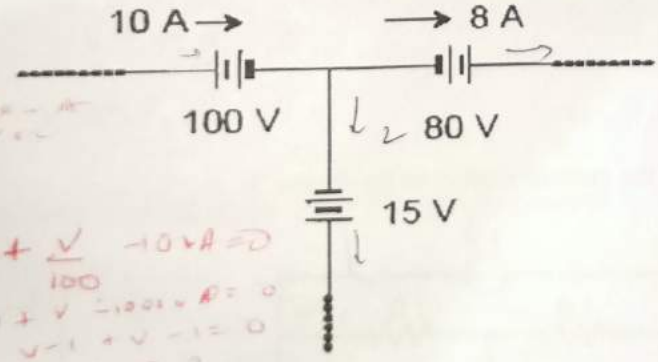
A. 1.0 A

B. 0.5 A

C. 0.1 A

D. 0.05 A

79. The three circuit elements shown in the figure are part of an electric circuit. The total power absorbed by the three circuit elements in watts is



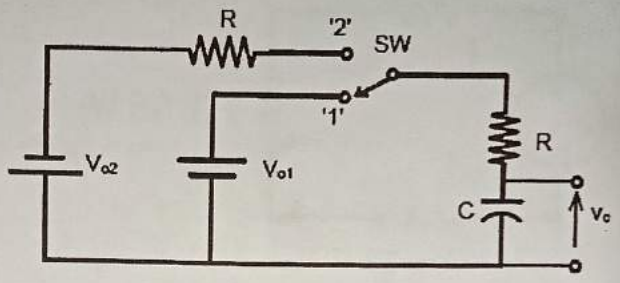
A. 1000

B. 640

C. 670

D. 330

80. The switch SW shown in the circuit is kept at position '1' for a long duration. At t = 0+, the switch is moved to position '2'. Assuming | Vo2 | > | Vo1 |, the voltage vc(t) across the capacitor is



A. $v_c(t) = -V_{o2}\,(1 - e^{-t/2RC}) - V_{o1}$

B. $v_c(t) = V_{o2}\,(1 - e^{-t/2RC}) + V_{o1}$

C. $v_c(t) = -(V_{o2} + V_{o1})\,(1 - e^{-t/2RC}) - V_{o1}$

D. $v_c(t) = (V_{o2} - V_{o1})\,(1 - e^{-t/2RC}) + V_{o1}$

81. The line A to neutral voltage is $10 \angle 15°$ V for a balanced three phase star-connected load with phase sequence ABC. The voltage of line B with respect to line C is given by

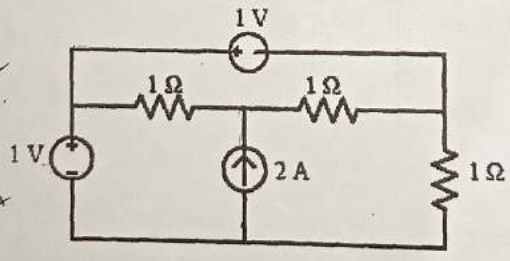
A. $10\sqrt{3} \angle 105°$ V

B. $10 \angle 105°$ V

C. $10\sqrt{3} \angle -75°$ V

D. $-10\sqrt{3} \angle 90°$ V

82. The power delivered by the current source, in the figure, is



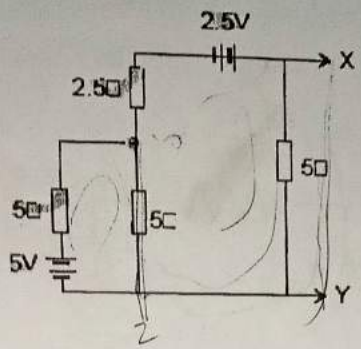
A. 3

B. 4

C. 6

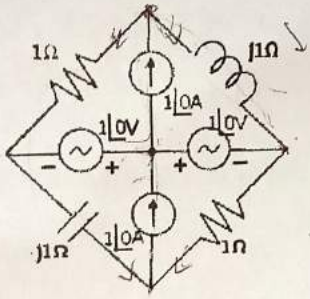
D. 12

83. The Norton's equivalent source in amperes as seen into the terminals X and Y is



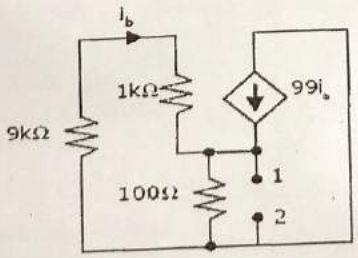
A. 1
B. 2
C. 3
D. 4

84. In the circuit shown below, the current through inductor is



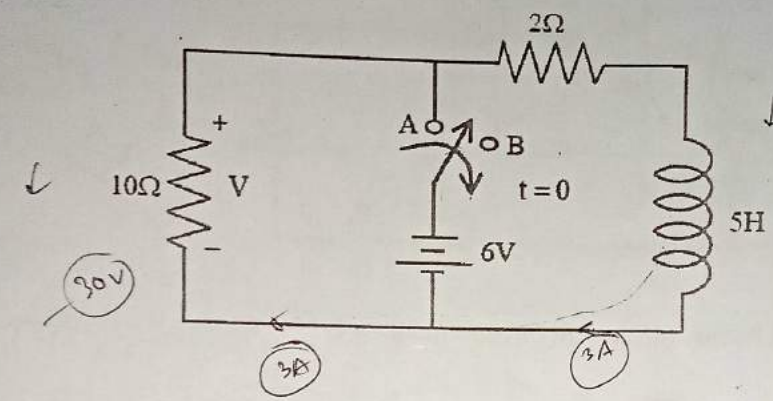
A. $\frac{2}{1+j}A$
B. $\frac{-1}{1+j}A$
C. $\frac{1}{1+j}A$
D. $0\,A$

85. The impedance between nodes 1 and 2 in the given circuit is



A. 50Ω
B. 100Ω
C. 50 KΩ
D. 10.1 KΩ

86. The circuit shown in figure was at steady state for $t < 0$ with the switch at position 'A'. The switch is thrown to position 'B' at time $t = 0$. The voltage V (volts) across the 10Ω resistor at time $t = 0^+$ is



A. 10

B. −30

C. 50

D. 20

87. The average real power in watts delivered to a load impedance $Z_L = (4 - j2)\Omega$ by an ideal current source $i(t) = 4\sin(\omega t + 20°)$ A is

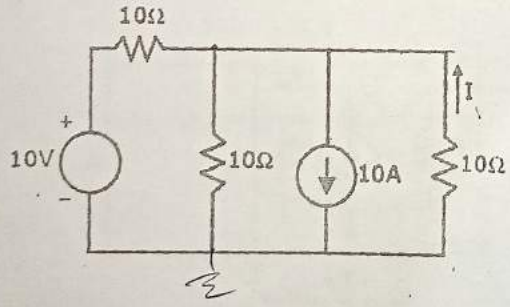
A. 64

B. 32

C. 16

D. 36

88. The current I shown in the circuit given below is equal to



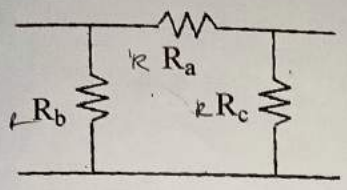
A. 3 A

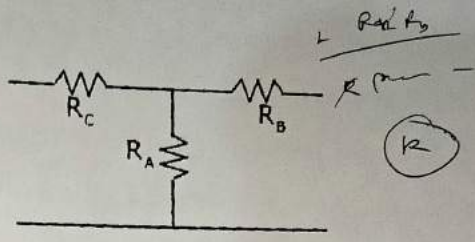
B. 2.67 A

C. 6 A

D. 9 A

89. Consider a delta connection of resistors and its equivalent star connection as shown. If all elements of the delta connection are scaled by a factor k, $k > 0$, the elements of the corresponding star equivalent will be scaled by a factor of





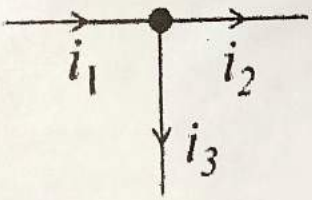
A. K^2

B. K

C. 1/K

D. $\sqrt{K}$

90. Three currents i_1, i_2 and i_3 meet at a node as shown in the figure below. If $i_1 = 3\cos(\omega t)$ ampere, $i_2 = 4\sin(\omega t)$ ampere and $i_3 = I_3\cos(\omega t + \theta)$ ampere, the value of I_3 in **ampere** is



A. 5

B. 6

C. 7

D. 8

91. A network has 10 nodes and 17 branches. The number of different node pair voltages would be:

A. 7

B. 9

C. 45

D. 10

92. Three equal resistances of 5Ω are connected in DELTA. What is the resistance in one of the arms of the equivalent STAR circuit?

A. 5

B. 1.33

C. 15

D. 10