Test Booklet Series

A

Paper No.

15

Written Test Paper, 2021

SENIOR SKILL INSTRUCTOR (ELECTRONICS)

Test Booklet No.

Name of Applicant .... Answer Sheet No. ....

Application No. : SVSU/2020/Estt/NT/ .... Signature of Applicant : ....

Date of Examination: **26 / 12 / 2021**

Signature of the Invigilator(s)

1. ....

Time of Examination : ....

2. ....

Duration : 60 Minutes] **[Maximum Marks : 50**

IMPORTANT INSTRUCTIONS

(i) The question paper is in the form of Test-Booklet containing **50 (Fifty)** questions. All questions are compulsory. Each question carries four answers marked (A), (B), (C) and (D), out of which only one is correct.

(ii) On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **50** questions. Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.

(iii) A separate Answer-Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are **50** rows containing four circles each. One row pertains to one question.

(iv) The candidate should write his/her Application number at the places provided on the cover page of the Test-Booklet/Question Paper and on the Answer-Sheet and NOWHERE ELSE.

(v) No second Test-Booklet/Question Paper and Answer-Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.

(vi) For every correct answer of the question **One (1) mark will be awarded.** For every unattempted question, Zero (0) mark shall be awarded. **There is no Negative Marking.**

(vii) Marking shall be done only on the basis of answers responded on the Answer-Sheet.

(viii) To mark the answer on the Answer-Sheet, candidate should **darken** the appropriate circle in the row of each question with Blue or Black pen.

(ix) For each question only **one** circle should be **darkened** as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries any mark, the question will be treated as cancelled.

(x) The candidates should not remove any paper from the Test-Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.

(xi) Rough work may be done on the blank space provided in the Test-Booklet/Question Paper only.

(xii) *Mobile phones (even in Switch-off mode) and such other communication/programmable devices are not allowed inside the examination hall.*

(xiii) No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO.

[P.T.O.

1 The hysteresis loop of a magnetic material has an area of 5 cm^2 with the scales given as 1 cm = 2 AT and 1 cm = 50 mWb. At 50 Hz, the total hysteresis loss is: -

(A) 15 W

(B) 20 W

(C) 25 W

(D) 50 W

2 A 3-phase delta/star transformer is supplied at 6000 V on the delta-connected side. The terminal voltage on the secondary side when supplying full load as 0.8 lagging power-factor is 415 V. The equivalent resistance and reactance drops for the transformer are 1% and 5% respectively. The turn's ratio of the transformer is: -

(A) 14

(B) 24

(C) 42

(D) 20

3 A 3-phase, 4-pole, 400 V, 50 Hz squirrel-cage induction motor is operating at a slip of 0.02. The speed of the rotor flux in mechanical rad/sec, sensed by a stationary observer, is closest to: -

(A) 1500

(B) 1470

(C) 157

(D) 154

4 In a constant V/f control of induction motor, the ratio V/f is maintained constant from 0 to base frequency, where V is the voltage applied to the motor at fundamental frequency f. Which of the following statements relating to low frequency operation of the motor is TRUE?

(A) At low frequency the stator flux increases from its rated value

(B) At low frequency the stator flux decreases from its rated value

(C) At low frequency the motor saturates

(D) At low frequency the stator flux remains unchanged at its rated value

5 If a 1 ohm, 2 ohm and 32/3 ohm resistor is connected in star, find the equivalent delta connection.

(A) 34 ohm, 18.67 ohm, 3.19 ohm

(B) 33 ohm, 18.67 ohm, 3.19 ohm

(C) 33 ohm, 19.67 ohm, 3.19 ohm

(D) 34 ohm, 19.67 ohm, 3.19 ohm

6 Which, among the following qualities, is not affected by the magnetic field?

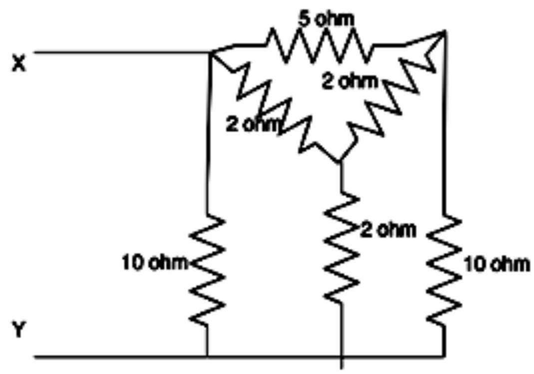
(A) Moving charge

(B) Change in magnetic flux

(C) Current flowing in a conductor

(D) Stationary charge

7 Find the equivalent resistance between X and Y.



(A) 3.33 ohm

(B) 4.34 ohm

(C) 5.65 ohm

(D) 2.38 ohm

8 An E.M.F. can be induced by _________

(A) Change in the magnetic field only

(B) Change in the area of cross section only

(C) Change in angle between magnetic field and area only

(D) Change in the magnetic field, area or angle between them

9 A substance whose relative permeability is less than the permeability of free space is?

(A) Diamagnetic

(B) Paramagnetic

(C) Ferromagnetic

(D) Not a magnetic substance

10. If the current in one coil is steady, what happens to the mutual inductance?

(A) Zero

(B) Infinity

(C) Doubles

(D) Halves

11. If current in a conductor increases then according to Lenz's law self-induced voltage will

(A) Aid the increasing current

(B) Tend to decrease the amount of current

(C) Produce current opposite to the increasing current

(D) Aid the applied voltage

12 As per Faraday's laws of electromagnetic induction, an e.m.f. is induced in a conductor whenever it

(A) Lies perpendicular to the magnetic flux

(B) Lies in a magnetic field

(C) Cuts magnetic flux

(D) Moves parallel to the direction of the magnetic field

13 Auto-transformer is used in transmission and distribution

(A) When operator is not available

(B) When iron losses are to be reduced

(C) When efficiency considerations can be ignored

(D) When the transformation ration is small

14 If an 8/9 ohm, 4/3 ohm and 2/3 ohm resistor is connected in star, find its delta equivalent?

(A) 4 ohm, 3 ohm, 2 ohm

(B) 1 ohm, 3 ohm, 2 ohm

(C) 4 ohm, 1 ohm, 2 ohm

(D) 4 ohm, 3 ohm, 1 ohm

15. The oxide layer formed in the MOSFET is :

(A) Metal oxide

(B) Silicon dioxide

(C) Poly Silicon oxide

(D) Oxides of Non metals

16 Which of the following is true about the resistance of a Zener diode?

(A) It has an incremental resistance

(B) It has dynamic resistance

(C) The value of the resistance is the inverse of the slope of the i-v characteristics of the Zener diode

(D) All of above

17 The Boolean function A + BC is a reduced form of: -

(A) AB + BC

(A) (A + B)(A + C)

(C) A'B + AB'C

(D) (A + C)B

18 One multiplexer can take the place of

(A) Several SSI logic gates

(B) Combinational logic circuits

(C) Several Ex-NOR gates

(D) Several SSI logic gates or combinational logic circuits

19 Which one of the following does not represent exclusive NOR of x and y: -

(A) xy + x'y'

(B) $x \oplus y'$

(C) $x' \oplus y$

(D) $x' \oplus y'$

20 What is the minimum number of gates required to implement the Boolean function AB + C if we have to use only 2-input NOR gate :

(A) 2

(B) 4

(C) 5

(D) 3

21 If the differential voltage gain and the common mode voltage gain of a differential amplifier are 48 dB and 2 dB respectively, then its common mode rejection ratio is: -

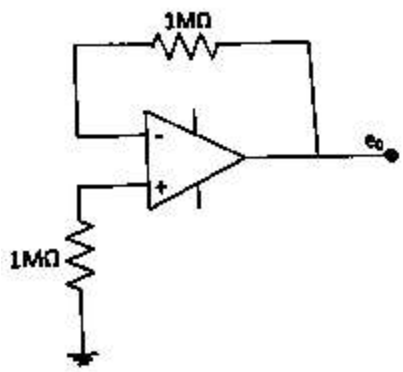
(A) 23 dB

(B) 25 dB

(C) 46 dB

(D) 50 dB

22 The voltage e_0 indicated in the figure has been measured by an ideal voltmeter, which of the following can be calculated?



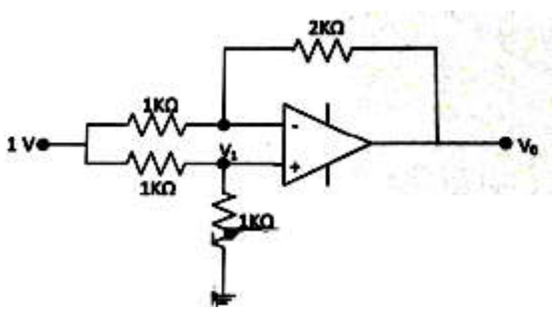
(A) Bias current of the inverting input only

(B) Bias current of the inverting and non-inverting inputs only

(C) Input offset current only

(D) Both the bias current and the input offset current

23 For the Op-Amp circuit shown in the figure. V_0 is



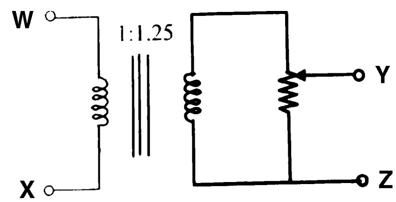
(A) –2 V

(B) –1 V

(C) –0.5 V

(D) 0.5 V

24. The following arrangement consists of an ideal transformer and an attenuator which attenuates by a factor of 0.8. An ac voltage V_{WX1} = 100 V is applied across WX to get open circuit voltage V_{YZ1} across YZ. Next, an ac voltage V_{YZ2} = 100 V is applied across YZ to get an open circuit voltage V_{WX2} across WX. Then, V_{YZ1}/V_{WX1}, V_{WX2}/V_{YZ2} are respectively,



(A) 125/100 and 80/100

(B) 100/100 and 80/100

(C) 100/100 and 100/100

(D) 80/100 and 80/100

25. The time domain behavior of an RL circuit is represented by

$$L\frac{di(t)}{dt} + Ri = V_0(1 + Be^{-Rt/L}\sin t)\,u(t)$$

For an initial current of i(0) = V_0 / R, the steady state value of the current is given by

(A) i(t) $\rightarrow$ V_0 / R

(B) i(t) $\rightarrow$ $2V_0$ / R

(C) i(t) $\rightarrow$ V_0 / R (1+B)

(D) $i(t) \rightarrow 2V_0 / (1+B)$

26. A 230 V rms source supplies power to two loads connected in parallel. The first load draws 10 kW at 0.8 leading power factor and the second one draws 10 kVA at 0.8 lagging power factor. The complex power delivered by the source is

(A) (18 + j 1.5) kVA

(B) (18 − j 1.5) kVA

(C) (20 + j 1.5) kVA

(D) (20 − j 1.5) kVA

27. An LC tank circuit consists of an ideal capacitor C connected in parallel with a coil of inductance L having an internal resistance R. The resonant frequency of the tank circuit is

(A) $\frac{1}{2\pi\sqrt{LC}}$

(B) $\frac{1}{2\pi\sqrt{LC}}\sqrt{1-R^2\frac{C}{L}}$

(C) $\frac{1}{2\pi\sqrt{LC}}\sqrt{1-\frac{L}{R^2C}}$

(D) $\frac{1}{2\pi\sqrt{LC}}\left(1-R^2\frac{C}{L}\right)$

28. If the base width in a bipolar junction transistor is doubled, which one of the following statements will be TRUE?

(A) Current gain will increase

(B) Unity gain frequency will increase

(C) Emitter-base junction capacitance will increase

(D) Early voltage will increase

29. A long-channel NMOS transistor is biased in the linear region V_{DS} = 50 mV and is used as a resistance. Which one of the following statements is NOT correct?

(A) If the device width W is increased, the resistance decreases

(B) If the threshold voltage is reduced, the resistance decreases

(C) If the device length L is increased, the resistance increases

(D) If V_{GS} is increased, the resistance increases

30. For an n-channel enhancement type MOSFET if the source is connected at a higher potential than that of the bulk (i.e. $V_{SB} > 0$), the threshold voltage V_T of the MOSFET will

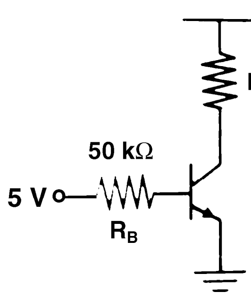
(A) remain unchanged

(B) decrease

(C) change polarity

(D) increase

31. In the circuit shown, the silicon BJT has $\beta = 50$. Assume $V_{BE} = 0.7$ V and $V_{CE(sat)} = 0.2$ V. Which one of the following statements is correct?



(A) For $R_c = 1$ kΩ, the BJT operates in the saturation region.

(B) For $R_c = 3$ kΩ, the BJT operates in the saturation region.

(C) For $R_c = 20$ kΩ, the BJT operates in the cut-off region.

(D) For $R_c = 20$ kΩ, the BJT operates in the linear region.

32. When the gate-to-source voltage (V_{GS}) of a MOSFET with threshold voltage of 400 mV, working in saturation is 900 mV, the drain current is observed to be 1 mA, Neglecting the channel Length modulation effect and assuming that the MOSFET is operating at saturation. The drain current for an applied V_{GS} of 1400 mV is

(A) 0.5 mA

(B) 2.0 mA

(C) 3.5 mA

(D) 4.0 mA

33. An amplifier using an Op-Amp with a Slew-Rate SR = 1 V/μsec, has a gain of 40 dB. If this Amplifier has to faith fully amplify sinusoidal signals from dc to 20 KHz. Without introducing any Slew Rate induced distortion, then the input signal level must not exceed

(A) 795 mV

(B) 395 mV

(C) 79.5 mV

(D) 39.5 mV

34. A pulse train with a frequency of 1 MHz is counted using a modulo-1024 ripple-counter built with J-K flip flops. For proper operation of the counter, the maximum permissible propagation delay per flip flop stage is _________

(A) 200 ns

(B) 300 ns

(C) 100 ns

(D) 150 ns

35. A 0 to 6 counter consists of 3 flip-flops and a combination circuit of 2 input gate(s). The combination circuit consists of

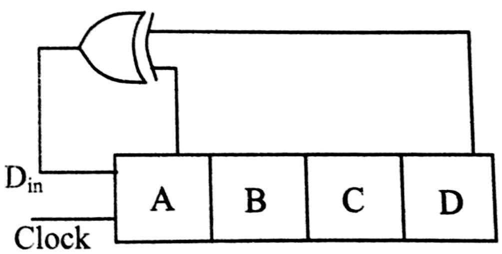
(A) one AND gate

(B) one OR gate

(C) one AND gate and one OR gate

(D) two AND gates

36. A 4-bit shift register circuit configured for right-shift operation is $D_{in} \rightarrow A$, $A \rightarrow B$, $B \rightarrow C$, $C \rightarrow D$ is shown. If the present state of the shift register is ABCD = 1101, the number of clock cycles required to reach the state ABCD = 1111 is



(A) 10

(B) 11

(C) 09

(D) 12

37. Consider a vector field $\overline{A}(\overline{r})$. The closed loop line integral $\oint \vec{A} \bullet \vec{dl}$ can be expressed as

(A) $\oiint (\nabla \times \vec{A}) \bullet d\vec{s}$ over the closed surface bounded by the loop

(B) $\oiiint (\nabla \bullet \vec{A}) dv$ over the closed volume bounded by the loop

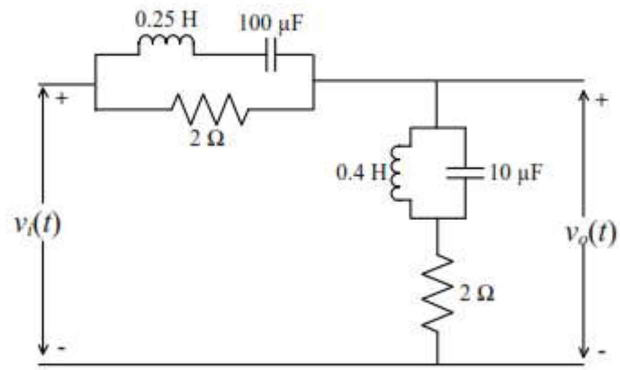
(C) $\iiint (\nabla \bullet \vec{A}) dv$ over the open volume bounded by the loop

(D) $\iint (\nabla \times \vec{A}) \bullet d\vec{s}$ over the open surface bounded by the loop

38. In the RLC circuit shown in the figure, the input voltage is given by

$v_i(t) = 2 \cos(200t) + 4 \sin(500t)$.

The output voltage $v_0(t)$ is



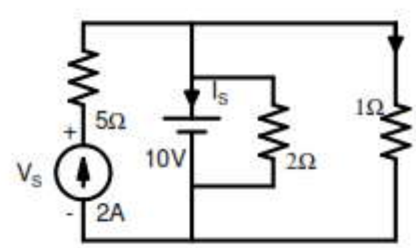
(A) 2 sin (200t) + 4 cos (500t)

(B) 2 cos (200t) + 4 sin (500t)

(C) cos (200t) + 2 sin (500t)

(D) sin (200t) + 2 cos (500t)

39. In the following figure find the current I_S in Amps in the voltage source, and voltage V_S in Volts across the current source respectively, are



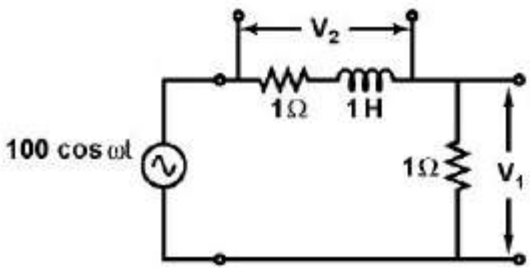
(A) 8, –10

(B) –8, 20

(C) $-13,\ 20$

(D) $13,\ -20$

40. In the circuit shown, the positive angular frequency ω (in radians per second) at which the magnitude of the phase difference between the voltages V_1 and V_2 equals $\pi/4$ radians, is ....



(A) 0.9 to 1.1

(B) 0.9 to 1.2

(C) 0.8 to 1.2

(D) 0.8 to 1.1

41. The average power delivered to an impedance $(4 - j3)\Omega$ by a current $5 \cos (100\pi t + 100)$A is

(A) 125 W

(B) 50 W

(C) 44.5 W

(D) 62.5 W

42. The depletion mode of MOSFET resemble semantically in the behaviour of JFET due to copious increase in ....

(A) negative gate voltage by enhancing its conductivity level

(B) negative source voltage by reducing its conductivity level

(C) negative gate voltage by reducing its conductivity level

(D) negative source voltage by enhancing its conductivity level

43. The pinch off voltage for a n - channel JFET is 4 V, when VGS = 1 V, the pinch-off occurs for VDS equal to

(A) 1 V

(B) 3 V

(C) 4 V

(D) 5 V

44. Zener diode, when used in voltage stabilization circuit is biased in

(A) Reverse bias region below the breakdown region

(B) Forward biased region.

(C) Reverse breakdown region.

(D) Forward biased constant current mode.

45. In LED light is emitted because

(A) Recombination of charge carriers take place

(B) Light falling on gets amplified

(C) Diode gets heated up

(D) Light gets reflected due to lens action

46. If a JFET has $I_{DSS} = 8$ mA and $V_P = 4$ V, then RDS equals

(A) 200 Ω

(B) 500 Ω

(C) 320 Ω

(D) 5 KΩ

47. There are two semiconductor diodes A and B. One of them is Zener where asother is Avalanche. Their ratings are 5.6 V and 24 V respectively then.

(A) A is Avalanche B is Zener

(B) A is Zener B is Avalanche

(C) both of them are Zener Diodes

(D) both of them are Avalanche Diodes

48. In a LC filter, the ripple factor

(A) Increases with the load current

(B) increases with the load resistance

(C) has the lowest value

(D) remains constant with the load current

49. A 2 bit binary multiplier can be implemented using

(A) 2 input ANDs only

(B) Two (2) input NORs and one XNOR gate

(C) XOR gates and shift registers

(D) 2 input X-ORs and 4-input AND gates only

50. Vector potential is a vector

(A) whose curl is equal to the magnetic flux density

(B) which is equal to the vector product E × H

(C) whose divergence is equal to the electric potential

(D) whose curl is equal to the electric field intensity

ROUGH WORK

Answer Key

Senior Skill Instructor (Electronics)

Ques. No.	Answer
1	C
2	B
3	C
4	D
5	D
6	A
7	D
8	D
9	A
10	A
11	C
12	C
13	D
14	A
15	B
16	D
17	B
18	D
19	D
20	C
21	C
22	C
23	C
24	B
25	A

Ques. No.	Answer
26	B
27	B
28	D
29	D
30	D
31	B
32	D
33	C
34	C
35	D
36	A
37	D
38	B
39	C
40	A
41	B
42	C
43	B
44	C
45	A
46	B
47	B
48	D
49	D
50	A