

GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

Electrical and Electronic Circuits 1
5240

JUNE 2023

INTERMEDIATE LEVEL

| | |
|----------------------------|--------------------------------|
| Specialty Name and Acronym | ELECTRICAL POWER SYSTEMS – EPS |
| Centre No | |
| Centre Name | |
| Candidate No. | |
| Candidate Name | |

Mobile phones are NOT allowed in the examination room.

5240 ELECTRICAL AND ELECTRONIC CIRCUITS 1: MULTIPLE CHOICE QUESTION PAPER

1 Hour 30 Minutes

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.

1. USE A SOFT HB PENCIL THROUGHOUT THE EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the examination begins:

3. Check that this question booklet is headed "Intermediate Level – 5240 ELECTRICAL AND ELECTRONIC CIRCUITS 1.
4. Insert the information required in the spaces above.
5. Insert the information required in the spaces provided on the answer sheet using your HB pencil:

Candidate Name, Exam Session, Subject Code, Centre Number and Candidate Identification Number.

Take care that you do not erase or fold the answer sheet or make any marks on it other than those asked for in these instructions.

How to answer the questions in this examination:

6. Answer ALL the 50 questions in this Examination. All questions carry equal marks.
7. Each question has FOUR suggested answers: A, B, C and D. Decide which answer is correct. Find the number of the question on the Answer Sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen.
For example, if C is your correct answer, mark C as shown below:
[A] [B] [C] [D]
8. Mark only one answer for each question. If you mark more than one answer, you will score a zero for that question. If you change your mind about an answer, erase the first mark carefully, then mark your new answer.
9. Avoid spending too much time on any one question. If you find a question difficult, move on to the next question. You can come back to this question later.
10. Do all rough work in this booklet, using, where necessary, the blank spaces in the question booklet.
11. At the end of the examination, the invigilators shall collect the answer sheet first and then the question booklets. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT.
12. Non Programmable Calculators are allowed

Turn Over

1.

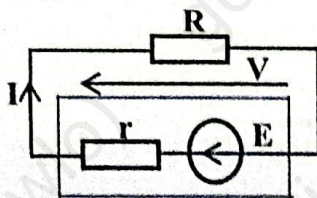


Figure 1

In electrical circuit of figure 1, the maximum power transferred is obtained when

- A $V \times I$
- B $R=r$
- C $E=(R+r)I^2$
- D $r=R$

2.

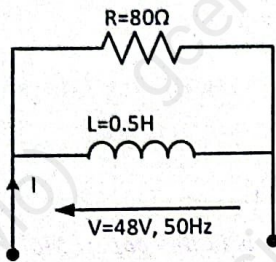


Figure 2

The components of the circuit on figure 2, are assumed ideal. Find the overall admittance of the circuit:

| | |
|---|------------------------------------|
| A | $71.28 \Omega^{-1}$ |
| B | $14.03 \times 10^{-3} \Omega$ |
| C | $14.03 \times 10^{-3} \Omega^{-1}$ |
| D | 71.28Ω |

3. An ideal diode is characterized by:

- A $V_o=0$ and $r_D=0$
- B $V_o=0.6V$ and $r_D \neq 0$
- C $V_o \neq 0$ and $r_D \neq 0$
- D $V_o=0$ and $r_D \neq 0$

4.

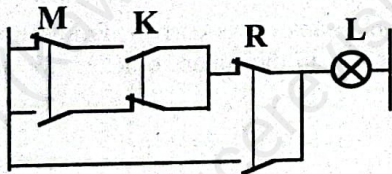


Figure 3

The logic circuit of figure 12 is designed to control the lamp L. the logic equation of the lamp is:

- A $L = \bar{R}M + \bar{R}(\bar{M}K + \bar{K}M)$
- B $L = (\bar{M}K + \bar{R}) + (\bar{K}M + \bar{R}) + R$
- C $L = \bar{R}M + R(M \oplus K)$
- D $L = R + \bar{R}(M \oplus K)$

5.

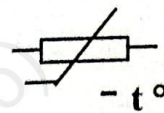


Figure 4

The symbol of the figure 4 is that of a

- A negative temperature coefficient
- B rheostat
- C potentiometer
- D positive temperature coefficient

6. If the phase angle between the voltage and current in a circuit is 195° , its equivalent value in radians is

- A 3.40 rad
- B 340 rad
- C 34. rad
- D 0.34 rad

7. A signal has 250 cycles per second, the time for 1 cycle will be

- A 40 s
- B $4 \mu s$
- C 40 ms
- D 4 ms

8. The value of a resistor whose colours are brown, black, black and silver is:

- A $1000 + 10\% \Omega$
- B $1000 \pm 10\% \Omega$
- C $1000 \pm 20\% \Omega$
- D $1000 \pm 10\% \Omega$

9. The value of a resistor whose colours are violet, white, blue and gold is

- A $79 \times 10^{-6} \pm 5\% \Omega$
- B $79 \pm 10\% m\Omega$
- C $79 \times 10^6 \pm 5\% \Omega$
- D $7.9 \times 10^6 \pm 5\% \Omega$

10. When four resistors of 2Ω are connected in parallel, their equivalent resistance of the combination is :

- A 0.5Ω
- B 4Ω
- C 2Ω
- D 8Ω

11. What is the cross sectional area of a conductor having a resistivity of $1.7 \times 10^{-8} \Omega m$ with a resistance of 4Ω and a length of 6m?

- A $8.55 \times 10^{-8} m^2$
- B $2.55 \times 10^{-8} m^2$
- C $85.5 \times 10^{-8} m^2$
- D $25.5 \times 10^{-8} m^2$

12. The capacitance of a capacitor is
- A The ability of a capacitor to change easily when supplied.
 - B The ability of a capacitor to charge and discharge.
 - C The ability of a capacitor to store electricity.
 - D The ability to stay long without discharging

13. A capacitor of $0.5\mu\text{F}$ store 2mJ of energy. What will be the voltage across the capacitor
- A 89.44V
 - B 28.28V
 - C 2.828V
 - D 29V

14.

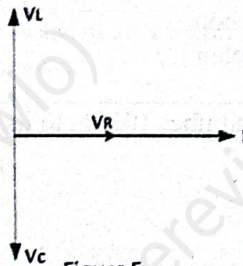


Figure 5

What does the phasor diagram in figure 5 represent?

- A A circuit with I and VR as reference
- B A circuit with current as reference phasor
- C Resonance in series RLC circuit
- D An RLC series circuit

15. A series RLC circuit has the following voltages across its components $V_R=61.8\text{V}$, $V_L=242.5\text{V}$, $V_C=164\text{V}$. what is the resultant voltage of the series circuit?

- A 9.5V
- B 100V
- C 95.5V
- D 10.10V

16.

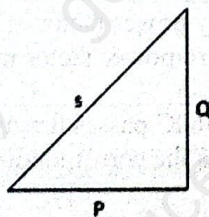


Figure 6

Figure 6 shows the power triangle of a circuit with $S=4.4\text{KVA}$ and $Q=2.6\text{KVAR}$, the value of the active power P is;

- A 3550W
- B 3.55KW
- C 3.4KW
- D 3.8KW

17. Under which condition do we confirm that a three phase connected circuit is balanced.

- A When the neutral current is $I_B = I_R$.
- B When the neutral current is $1/3$ of I_Y
- C When there is neutral current
- D When the neutral current is zero or negligible

18. In a three phase delta connected circuit, which is the correct relationship of for the line current I_L and phase current I_P ?

- A $I_P = I_L$
- B $I_P = I_L\sqrt{2}$
- C $I_P = (I_L/\sqrt{3})^2$
- D $I_P = I_L/\sqrt{3}$

19.

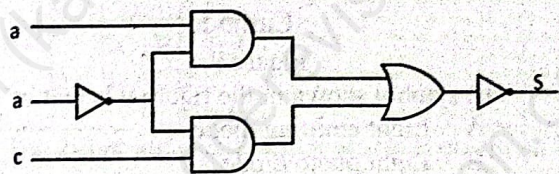


Figure 7

In the logic diagram of the figure 7, the output S of the logic diagram is;

- A $\overline{a+b+c}$
- B $a + \overline{b} + c$
- C $a + \overline{b} + c$
- D $a+b+c$

20.

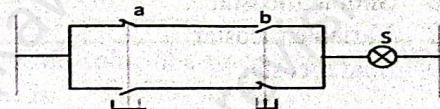


Figure 8

Figure 8 shows the logic representation using contacts with two inputs and one output. The output equation S is given by:

- A $S = \overline{a}b + ab$
- B $S = a\overline{b} + \overline{a}b$
- C $S = \overline{a}\overline{b} + \overline{a}b$
- D $S = ab + \overline{a}b$

21. The decimal equivalent of the binary number 11010_2 is:
- A 24
 - B 25
 - C 26
 - D 27

22. Convert 203_{10} to its binary equivalent.

- A 11100011_2
- B 11011011_2
- C 11001011_2
- D 11010101_2

23.

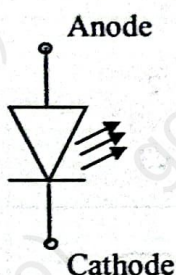


Figure 9

The symbol shown in the figure 9 is that of

- A Light emitting diode
- B Light photo diode
- C Light dependent diode
- D Electronic diode

24.

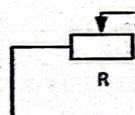


Figure 10

The symbol of the figure 10 is that of a

- A Rheostat
- B Sliding rheostat
- C Variable rheostat
- D Stud rheostat

25.

| a | b | c | R |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

Table 1

The output R of the truth table is:

- A $R = \bar{a}\bar{b}c + \bar{a}b\bar{c} + abc$
- B $R = \bar{a}bc + a\bar{b}c + abc$
- C $R = \bar{a}\bar{b}c + a\bar{b}c + abc$
- D $R = abc + \bar{a}\bar{b}c + \bar{a}b\bar{c}$

26. Ten resistors of 10Ω each connected in parallel has as equivalence resistance

- A 1Ω
- B 100Ω
- C 10Ω
- D 20Ω

27. The most commonly used semiconductor is:

- A Germanium
- B Silicon
- C Carbon
- D sulphur

28. The binary number 10101_2 to its decimal equivalent is:

- A 31
- B 12
- C 21
- D 22

29. The potential difference across a resistor dissipating $500W$ of power while taking a current of $2A$ is

- A $502V$
- B $1000V$
- C $125V$
- D $250V$

30. Three Gigahertz equals

- A $30000000Hz$
- B $300000000Hz$
- C $3000000000Hz$
- D $3000000Hz$

31. A purely inductive load will impose:

- A A leading power factor in the circuit
- B A lagging power factor in the circuit
- C Unity power factor in the circuit
- D A zero power factor in the circuit

32. A charge of $360C$ passes through a conductor in $20ms$. What is the corresponding current in amperes is

- A $0.018A$
- B $18A$
- C $180A$
- D $18000A$

33. A battery is rated at 200Ah. how many hours can it continuously supply a current of 2A?
 A 400H
 B 202H
 C 198H
 D 100H
-
34. Four batteries of 12 volts each when connected in parallel will supply;
 A 12V
 B 24V
 C 48V
 D 36V
-
35. The period of a sine wave of frequency 60Hz is
 A $T=0.016\text{sec}$
 B $T=60\text{secs}$
 C $T=0.06\text{secs}$
 D $T=0.02\text{secs}$
-
36. The power factor of an ac circuit with a purely capacitive load is:
 A Leading
 B Lagging
 C Unity
 D Zero
-
37. Which of the following statement is not true for a poor power factor?
 A It reduces load handling capability of electrical system
 B Improves on the efficiency of the system
 C It results in more power losses in the system
 D It overloads transformers and distribution lines.
-
38. The complement of the expression $a\bar{b} + \bar{c}d$ is
 A $(a+b)(c + \bar{d})$
 B $(\bar{a} + b)(c + \bar{d})$
 C $(\bar{a} + b)(c + \bar{d})$
 D $(a+b)(\bar{c}+d)$
-
39. Two equivalent capacitors in series will have as equivalent capacitance:
 A $2C$
 B C
 C C^2
 D $C/2$
-
40. A capacitor with value 0.0000001F is equal to :
 A 10pF
 B 100nF
 C 10 μ F
 D 10MF
-
41. The work done in moving a unit positive charge (from one point to another) is known as
 A Electric charge
 B Electric field
 C Electric potential
 D Electric current
-
42. A silicon controlled rectifier has
 A One pn junction
 B Two pn junctions
 C Three pn junctions
 D Four pn junctions
-
43. A thyristor is also called
 A Silicon controlled rectifier
 B Transistor
 C Diac
 D Triac
-
44. The boolean expression $BC+B\bar{D} + BC + B\bar{D} + CD$ simplifies to
 A $BC+B\bar{D}$
 B $CD+B\bar{D}$
 C $BC+B\bar{D} + A$
 D $BC+CD$
-
45. The 2-inpt logic gate which provides output as 0 when both inputs are same (either 0 or 1) is
 A XNOR
 B XOR
 C NOR
 D NAND
-
46. Capacitors for power factor improvement are rated in
 A KVA
 B KVA
 C KVAR
 D KW
-
47. The RMS value of a sine wave is 127.4V. Its peak value is
 A 180.17
 B 398.78
 C 230V
 D 240V
-
48. The binary number $(1010111)_2$, when converted to base 8 is
 A 271_8
 B 127_8
 C 172_8
 D 712_8

49. A resistance material has an average length of 250cm, a cross sectional area of 0.125mm^2 and resistivity of $24 \times 10^{-7}\Omega\text{m}$; its resistance is

- A 148Ω
- B 100Ω
- C 48Ω
- D 25Ω

6

50. The conversion of octal number $(304)_8$ into binary gives

- A 100111100
- B 100111011
- C 001000100
- D 011000100

STOP

GO BACK AND CHECK YOUR WORK