AL/2025/16/E-I

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2025
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2025
General Certificate of Education (Adv. Level) Examination, 2025

විදුලිය, ඉලෙක්ට්‍රොනික හා තොරතුරු තාක්ෂණවේදය I
மின், இலத்திரன், தகவல் தொழினுட்பவியல் I
Electrical, Electronic and Information Technology I

16 E I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

- ✻ *Answer **all** the questions.*
- ✻ *Write your **Index Number** in the space provided in the answer sheet.*
- ✻ *Instructions are given in the back of the answer sheet. Follow them carefully.*
- ✻ *In each of the questions **1** to **50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (×) in accordance with the instructions given in the back of the answer sheet.*
- ✻ *Use of calculators is not allowed.*

1. What is the SI unit used for electrical power?
(1) A (2) V (3) J (4) W (5) Nm

2. The item which is needed in domestic electrical installations is,
(1) ammeter. (2) voltmeter. (3) socket outlet. (4) multimeter. (5) oscilloscope.

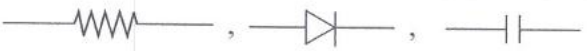
3. Select the answer with correct symbols for resistor, capacitor and diode in order.

(1) 

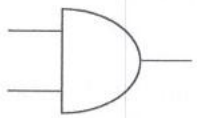
(2) 

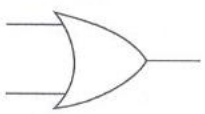
(3) 

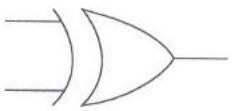
(4) 

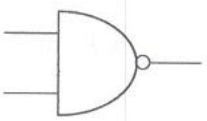
(5) 

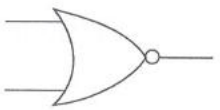
4. Out of the below circuits, which logic gate's output is high only when both inputs are logic '1'?

(1) 

(2) 

(3) 

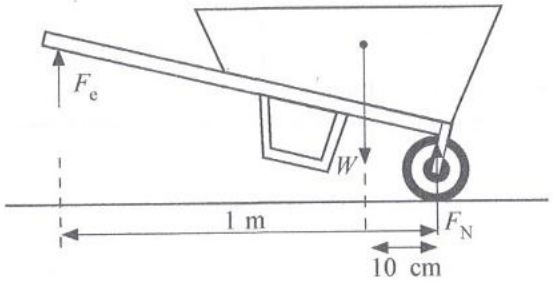
(4) 

(5) 

[See page two

- Answer the question **5** and **6** using below figure.

A wheelbarrow used to transport sand in a construction site is shown in the figure. The combined weight (W) of the wheelbarrow and sand is 40 kg. The combined weight has a perpendicular distance of 10 cm and the force generated from hand (F_e) has a perpendicular distance of 1 m from the axis of the wheel as shown in the figure. Consider acceleration of gravity as 10 m s^{-2}.



5. What is the upward force (F_e) that should be applied by the operator to lift the load?
(1) 40 N (2) 80 N (3) 100 N (4) 200 N (5) 400 N

6. Force exerted by the wheel (F_N) on the ground is,
(1) 40 N. (2) 200 N. (3) 360 N. (4) 400 N. (5) 440 N.

7. Consider the following statements.
A - Coarse aggregate is not used in cement blocks.
B - Hollow blocks are lighter than solid blocks.
C - Fine aggregate should be carefully selected for making cement blocks.
D - Cement to sand ratio 1:15 can be recommended.
Which of the above statements are true regarding solid and hollow cement blocks?
(1) *A, B* and *C* only. (2) *A, B* and *D* only. (3) *A, C* and *D* only.
(4) *B, C* and *D* only. (5) *A, B, C* and *D* all.

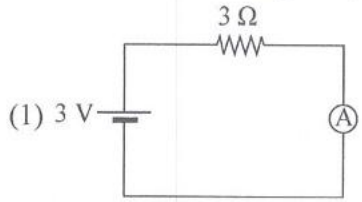
8. Consider the following statements about deceleration.
A - Its SI unit is m s^{-2}.
B - It is a scalar quantity.
C - It can be calculated by rate of change of velocity.
D - It has the same units as acceleration.
Out of the above, which statements are correct related to deceleration?
(1) *A, B* and *C* only (2) *A, B* and *D* only (3) *A, C* and *D* only
(4) *B, C* and *D* only (5) *A, B, C* and *D* all

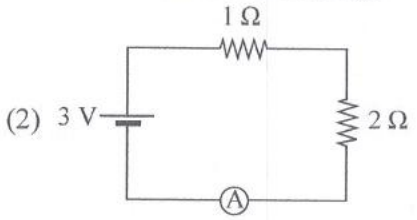
9. A student has calculated the length and the width of his land as 72 m × 23 m, respectively. His grandfather wants to know the extent in Perches. The correct extent of the land is,
(1) 65.47 Perch. (2) 66.24 Perch. (3) 74.23 Perch.
(4) 86.76 Perch. (5) 112.65 Perch.

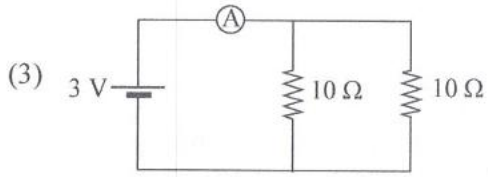
10. A surveyor has measured the distance between point *A* and *B* using the Gunter's chain as 2 chains and 75 links. However, a technician wants to find the distance in meters. The correct value for this distance is,
(1) 49.71 m. (2) 55.32 m. (3) 62.51 m. (4) 72.15 m. (5) 74.97 m.

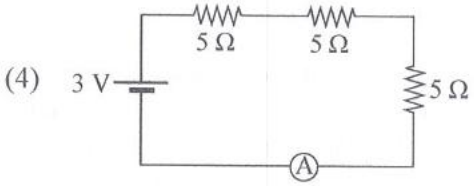
[*See page three*

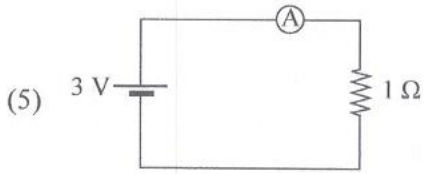
11. Out of the below diagrams, which is the circuit with the lowest Ammeter reading?

(1) 

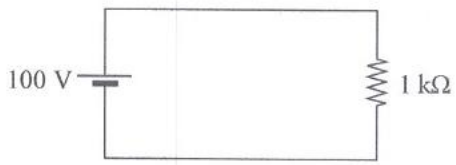
(2) 

(3) 

(4) 

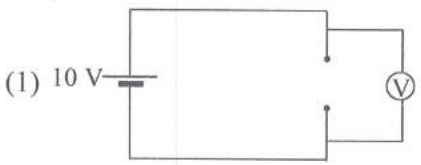
(5) 

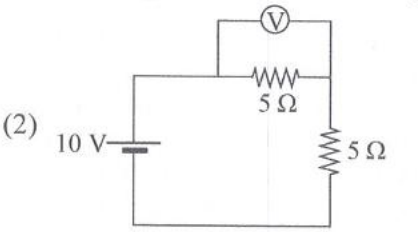
12. A student has tested the below circuit. What is the power dissipation across the resistor?

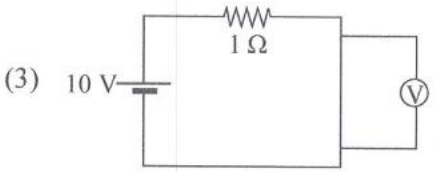


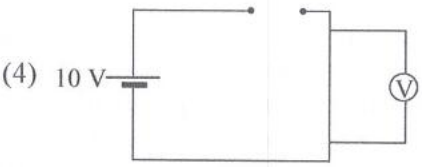
(1) 1 W
(2) 10 W
(3) 100 W
(4) 200 W
(5) 500 W

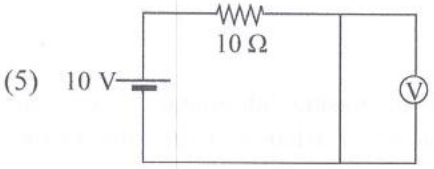
13. Out of the below circuit diagrams, which is the circuit with the highest voltmeter reading?

(1) 

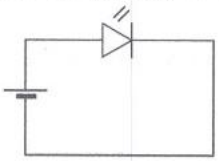
(2) 

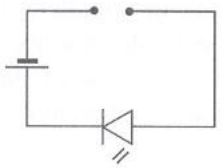
(3) 

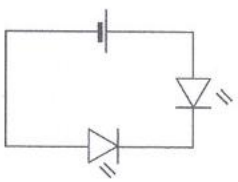
(4) 

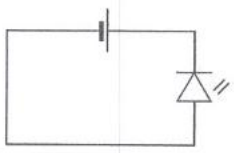
(5) 

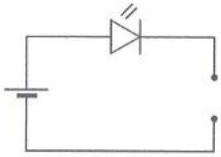
14. Select the circuit in which the LED is ON.

(1) 

(2) 

(3) 

(4) 

(5) 

[See page four

15. Consider the below steps.
A - Switching off the main switch of the power supply.
B - Usage of foam spray fire extinguisher to control fire.
C - Usage of Carbon dioxide fire extinguisher to control fire.
Out of the above steps, what are the step/steps that should be taken to control the fire erupted at an office in a construction site?
(1) *B* only. (2) *C* only. (3) *A* and *B* only.
(4) *A* and *C* only. (5) *A*, *B* and *C* all.

16. Consider the following statements.
A - Gypsum is used for manufacturing Plaster of Paris.
B - Portland cement is a compounds that contains of calcium, silica, alumina and iron oxide.
C - Bitumen is petroleum by-product used for road surfacing.
D - Fly ash can be used as a pozzolanic material in cement concrete.
Which of the above statements are true about commonly used construction materials?
(1) *A* and *B* only. (2) *B* and *D* only. (3) *A*, *B* and *C* only.
(4) *A*, *C* and *D* only. (5) *A*, *B*, *C* and *D* all.

17. Consider the following statements.
A - Coefficient of static friction is higher than coefficient of dynamic friction.
B - Friction is not always beneficial to human life.
C - When the weight of an object increases, frictional force is increased.
Which of the above statement/s is/are true regarding friction?
(1) *A* only. (2) *A* and *B* only. (3) *A* and *C* only.
(4) *B* and *C* only. (5) *A*, *B* and *C* only.

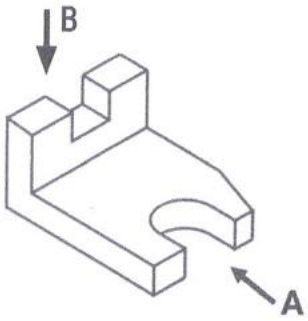
18. What is the choice that states the four-strokes of a petrol engine in order?
(1) Intake→Compression→Expansion→Cooling
(2) Intake→Expansion→Compression→Exhaust
(3) Compression→Expansion→Exhaust→Cooling
(4) Intake→Compression→Power→Exhaust
(5) Intake→Power→Expansion→Exhaust

19. The main function of a gearbox of an automobile is to,
(1) increase the speed of the engine.
(2) maintain constant torque at all speeds.
(3) vary torque and speed according to driving requirements.
(4) convert linear motion to rotary motion.
(5) reduce fuel consumption of the vehicle.

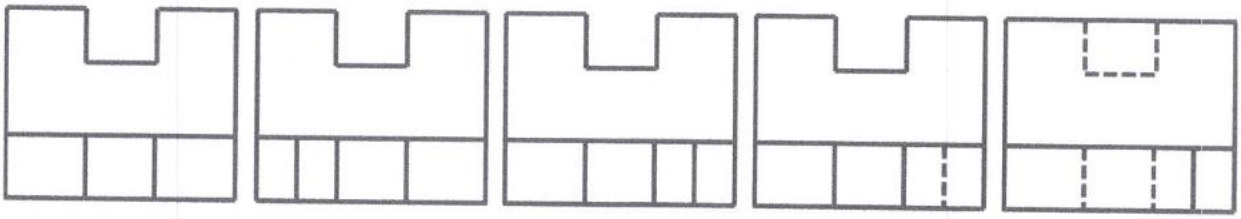
20. When a block rests on a horizontal surface and a gradually increasing horizontal force is applied, which of the following statements correctly describes the nature of friction before the block starts to move?
(1) The frictional force remains constant irrespective of the applied force.
(2) The frictional force decreases as the applied force increases.
(3) The frictional force increases with the applied force up to a certain maximum value.
(4) The frictional force acts in the direction of the applied force.
(5) The frictional force becomes zero just before the block moves.

[See page five

- Answer question No. **21** and **22** referring to the isometric view of the machine component shown in the figure.

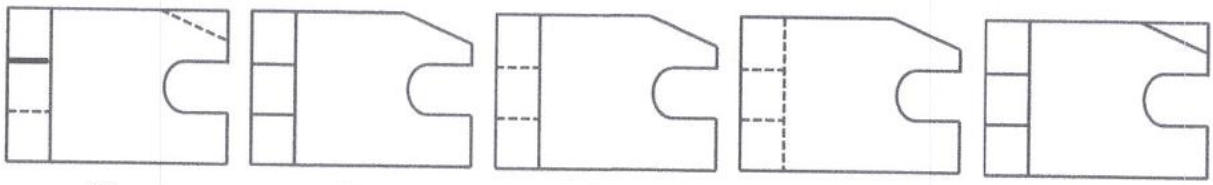


21. What is the correct orthogonal projection when viewed from the direction of arrow **A**?



(1) (2) (3) (4) (5)

22. What is the correct orthogonal projection when viewed from the arrow **B**?

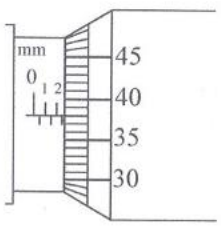


(1) (2) (3) (4) (5)

23. When designing a chair to be used in a computer laboratory, which of the following anthropometric measures is most critical for determining the seat height?

(1) Shoulder height
(2) Elbow rest height
(3) Thigh clearance
(4) Popliteal height
(5) Eye height

24. The figure shows a micrometer screw gauge measurement of a machine component.



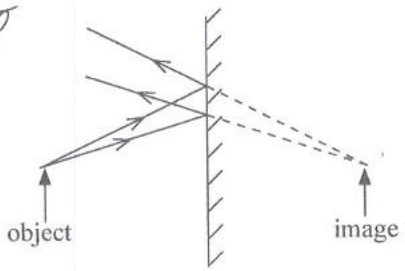
What is the reading?

(1) 2.38 mm (2) 2.88 mm (3) 3.38 mm (4) 3.88 mm (5) 5.38 mm

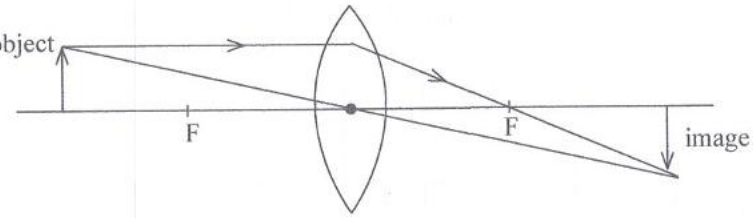
[See page six

25. A group of students is studying on behaviour of light rays. According to their observations, following line diagrams are shown below. Which of the below diagrams is **incorrect**?

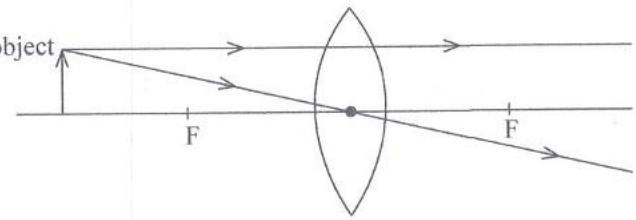
(1)



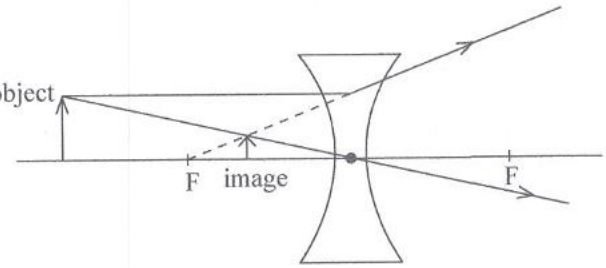
(2)



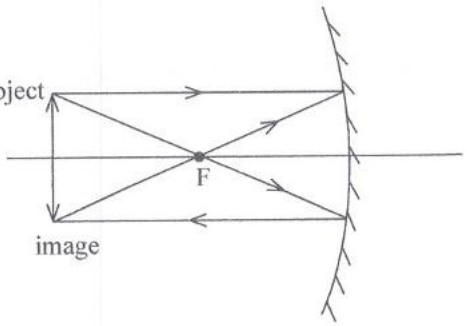
(3)



(4)

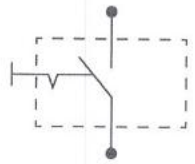


(5)

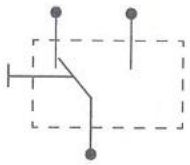


[See page seven

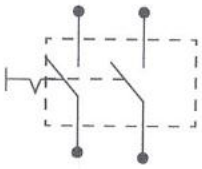
26. Which is the double pole single throw switch used in domestic wiring circuits?



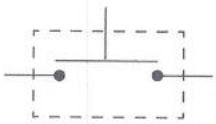
(1)



(2)



(3)

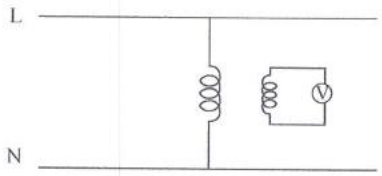


(4)

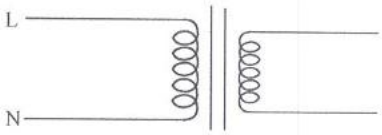
(5)

27. Which option represents the energy (kWh) meter?

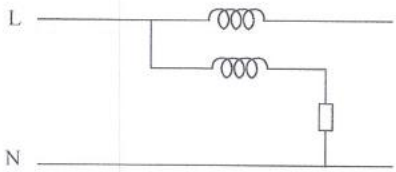
(1)



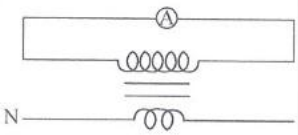
(2)



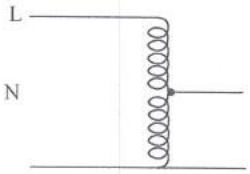
(3)



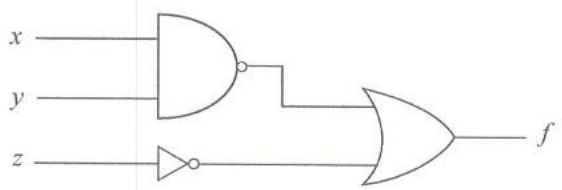
(4)



(5)



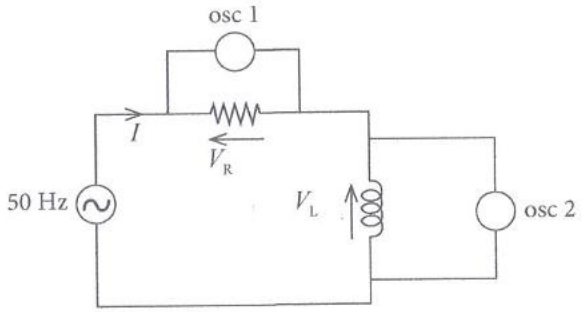
28. What is the correct Boolean expression for the output f of the digital circuit shown below?



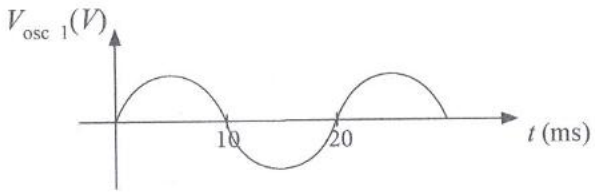
(1) $xy + z$
(2) $xy + \overline{z}$
(3) $\overline{xy} + \overline{z}$
(4) $(\overline{x + y})\,\overline{z}$
(5) $(x + y)\overline{z}$

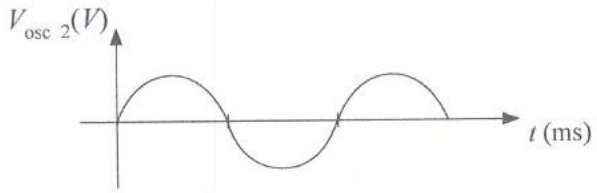
[See page eight

29. Consider following circuit arrangement.

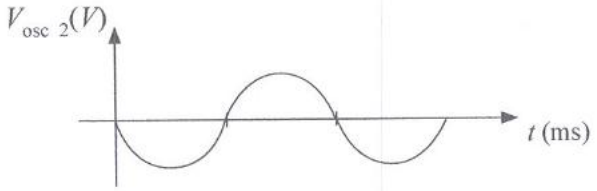


Voltage waveform shown in osc 1 oscilloscope is given below. Select the correct waveform for osc 2 oscilloscope.

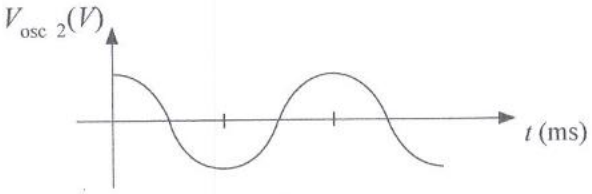




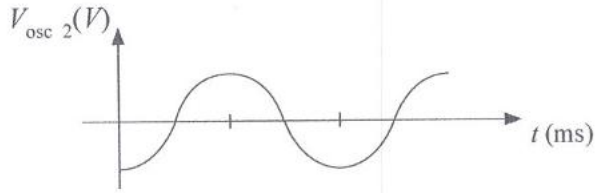
(1)



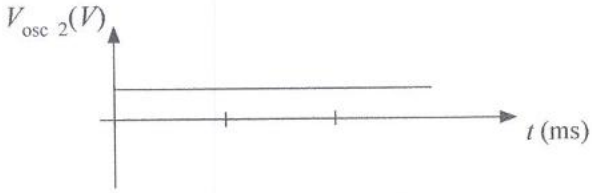
(2)



(3)



(4)



(5)

30. Consider the statements given below regarding an ideal operational amplifier.

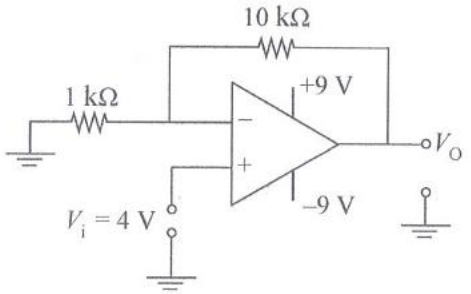
A - The open loop gain is infinite
B - The bandwidth is infinite
C - The input impedance is infinite

Out of the above statements, which statement/s is/are true?

(1) *A* only. (2) *A* and *B* only. (3) *A* and *C* only.
(4) *B* and *C* only. (5) *A*, *B* and *C* all.

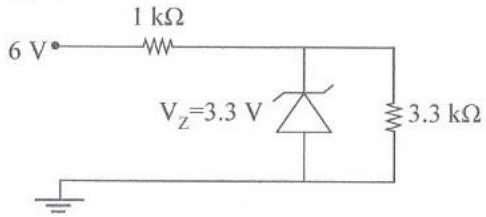
[*See page nine*

31. What is the output voltage of non inverting amplifier shown below? Assume that the operational amplifier is ideal. Here, V_i= 4 V



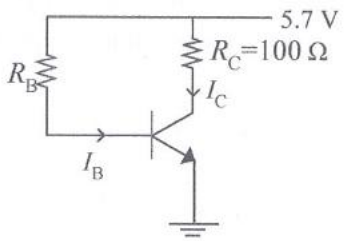
(1) −40 V (2) −9 V (3) 9 V (4) 10 V (5) 44 V

32. A simple circuit consisting of a Zener diode is shown below. Determine the current going through the Zener diode. Here V_Z=3.3 V



(1) 1 mA (2) 1.7 mA (3) 2.7 mA
(4) 3.3 mA (5) 6 mA

- Consider the following circuit to answer questions **33** and **34**. The transistor is mode of Si and β = 90. Assume that the transistor is in the active regin.



33. If I_B = 200 μA, what is R_B (Assume that V_{BE} = 0.7 V.) ?

(1) 25 Ω (2) 28.5 Ω (3) 2.5 kΩ (4) 5.7 kΩ (5) 25 kΩ

34. What is the value of V_{CE}?

(1) 0.2 V (2) 1.8 V (3) 2 V (4) 3.9 V (5) 5.7 V

35. Following *A*, *B*, *C* conductors are tested by a group of students.

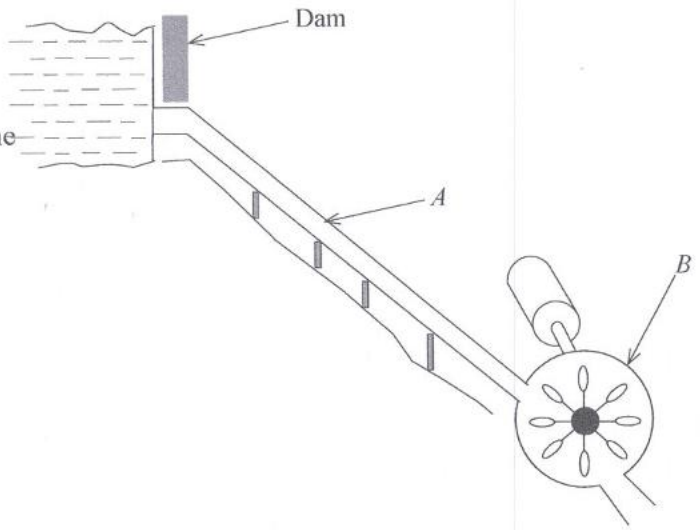
Conductor	Cross section Area	Resistivity	Length
A	A	ρ	3 l
B	2A	ρ	l
C	3A	2ρ	$2l$

What is the correct proportion of resistance *A*:*B*:*C*?

(1) 1:1:4 (2) 1:2:1 (3) 3:1:4 (4) 6:1:8 (5) 18:3:8

[See page ten

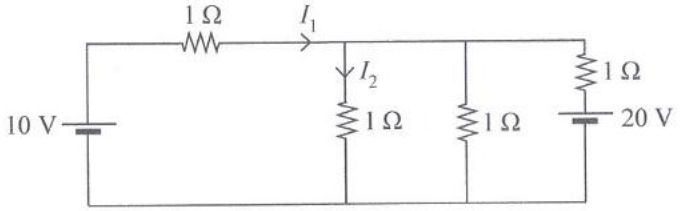
36. Consider following layout of a hydro power plant.



What are shown by *A* and *B* here?

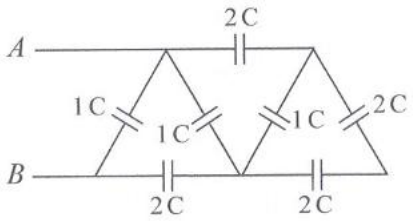
(1) *A* - Penstock, *B* - Pelton wheel turbine
(2) *A* - Generator, *B* - Penstock
(3) *A* - Generator, *B* - Dam
(4) *A* - Penstock, *B* - Penstock
(5) *A* - Vicate gate, *B* - Turbine

37. Determine currents I_1 and I_2 in the circuit shown below.



(1) 0 A, 5 A
(2) 0 A, 10 A
(3) 5 A, 5 A
(4) 5 A, 10 A
(5) 10 A, 0 A

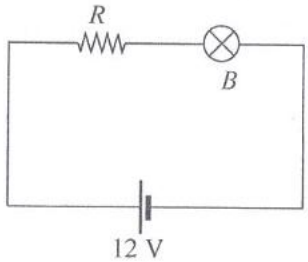
38. Determine the equivalent capacitance between terminals *A* and *B* for the capacitor network shown below. The network contains a combination of capacitors connected in series and parallel.



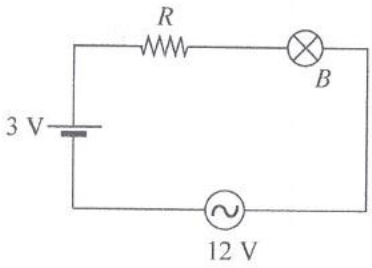
(1) C (2) 2 C (3) 3 C (4) 4 C (5) 5 C

[See page eleven

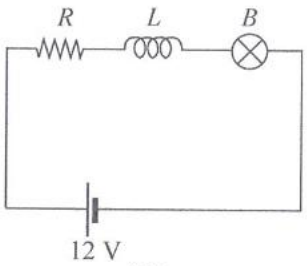
39. In all circuits shown below, a similar bulb B has been used.



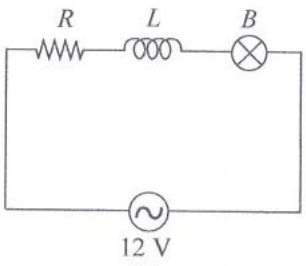
(P)



(Q)



(R)



(S)

Consider following statements related to these circuits.

A - light output in both P and Q are similar.

B - light output in both R and S are similar.

C - Resistance to current flow is higher in S than R.

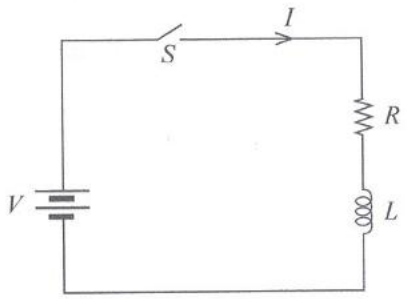
D - Resistance to current flow in Q is higher than P.

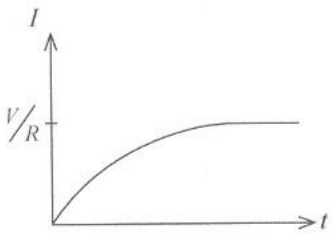
Out of the above, correct statements are,

(1) A and B only. (2) A and C only. (3) A and D only.
(4) B and C only. (5) A, B, C, D all.

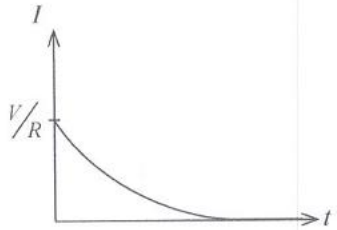
[See page twelve

40. A DC voltage source of voltage V is connected in series with a resistor R and an inductor L. The switch is closed at $t = 0$, and current starts flowing through the circuit. Out of the below graphs, which graph correctly represents the current through the circuit as a function of time for $t \geq 0$.

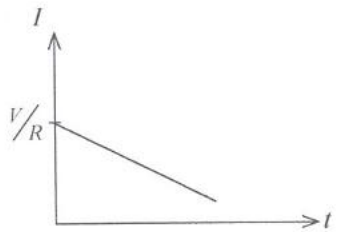




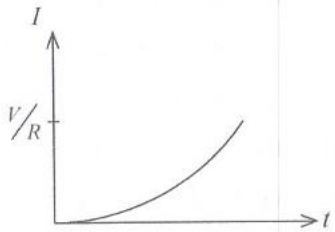
(1)



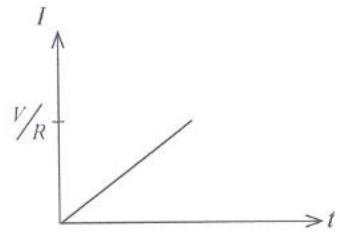
(2)



(3)

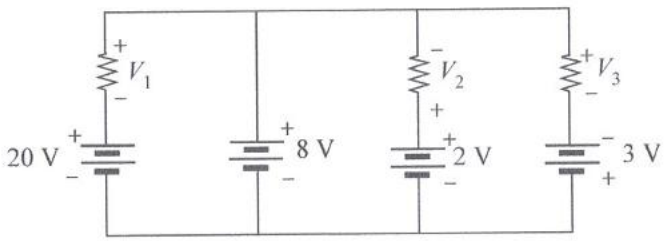


(4)



(5)

41. For the DC network shown below, what are the voltages V_1, V_2 and V_3?

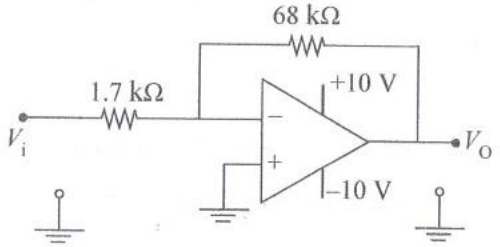


(1) 10 V, –6 V, 12 V
(2) 10 V, 6 V, 11 V
(3) 11 V, 6 V, 12 V
(4) 12 V, 4 V, 10 V
(5) –12 V, –6 V, 11 V

[See page thirteen

42. What is the gain of the inverting amplifier shown below? Assume that the op amp is ideal.

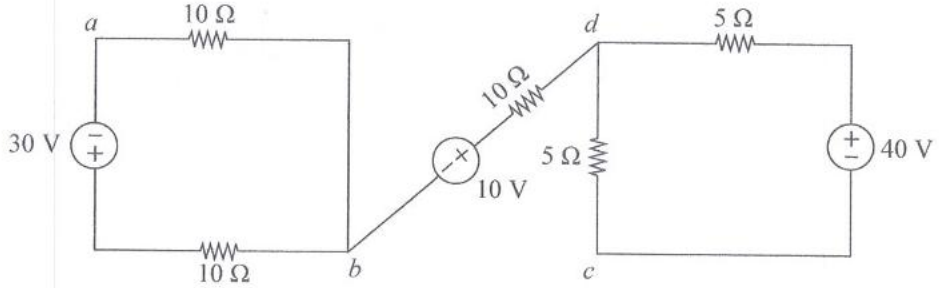
(1) – 40
(2) 1.7
(3) 40
(4) 41
(5) 68



43. A DC supply of 12 V has an internal resistance of 3 **Ω**. What value of load resistance R_L will receive maximum power, and what is the maximum power delivered to the load?

(1) R_L= 1.5 **Ω**, P_{max} = 6 W
(2) R_L= 3 **Ω**, P_{max} = 12 W
(3) R_L= 6 **Ω**, P_{max} = 18 W
(4) R_L= 9 **Ω**, P_{max} = 24 W
(5) R_L= 12 **Ω**, P_{max} = 30 W

44. Find the voltage V_{ac} in the circuit shown below.



(1) –5 V (2) –10 V (3) –15 V (4) –20 V (5) –30 V

45. Two capacitors, C_1 = 40 μF and C_2 = 80 μF, are initially charged to 60 V and 30 V respectively. After that, when they are connected in parallel with their positive plates together and negative plates together, determine the final common voltage across the capacitors.

(1) 30 V (2) 40 V (3) 50 V (4) 60 V (5) 70 V

46. Which two mechanisms does a MCB use to detect fault currents?

(1) Capacitive and resistive
(2) Thermal and magnetic
(3) Inductive and resistive
(4) Photovoltaic and magnetic
(5) Hydraulic and pneumatic

47. A resistive load is connected to a 400 V power supply, the source delivers 10 W of power. Determine the time required for a total charge of 45 C to flow through the load.

(1) 1 minute (2) 2 minutes (3) 3 minutes (4) 4 minute (5) 5 minutes

[See page fourteen

48. Two identical capacitors, C_1 and C_2 each of capacitance C, are charged to a voltage V. After charging, they are disconnected from the source and connected separately across resistors to discharge:

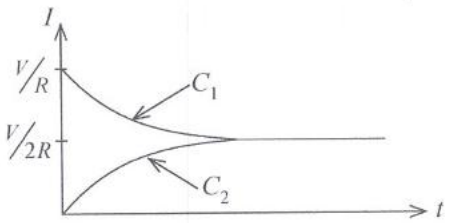
Capacitor C_1 is connected to a resistor R.

Capacitor C_2 is connected to a resistor $2R$.

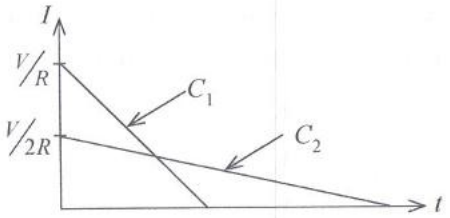
At $t = 0$, both capacitors started discharging simultaneously.

The current through each resistor is measured as a function of time. Possible current-time graphs are shown below. What is the graph that correctly represents the current in each resistor during discharge?

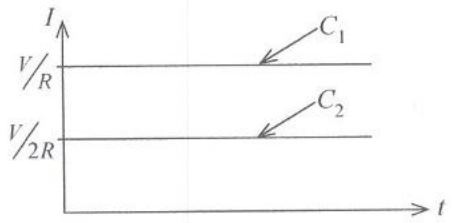
(1)



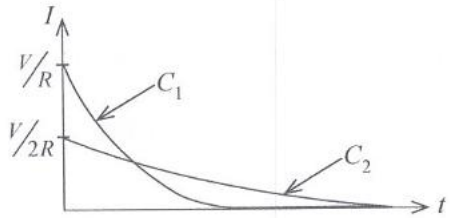
(2)



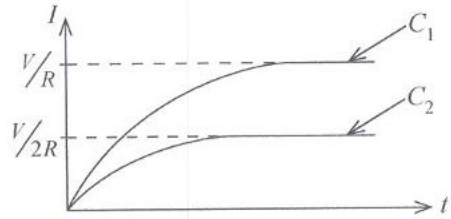
(3)



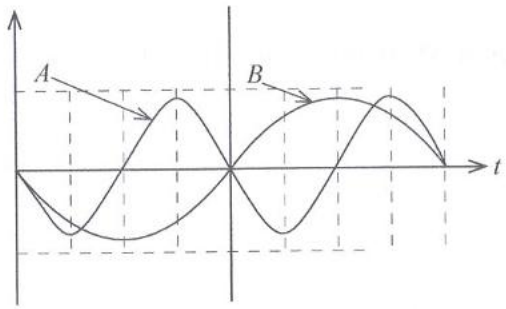
(4)



(5)



49. Consider following display of an oscilloscope. Select the correct answer with cycle time and frequencies of A, and B sinusoidal waveforms. Time scale setting is set to 2.5 ms per division.



(1) A - 20 ms, 50 Hz, B - 10 ms, 100 Hz

(2) A - 10 ms, 100 Hz, B - 20 ms, 50 Hz

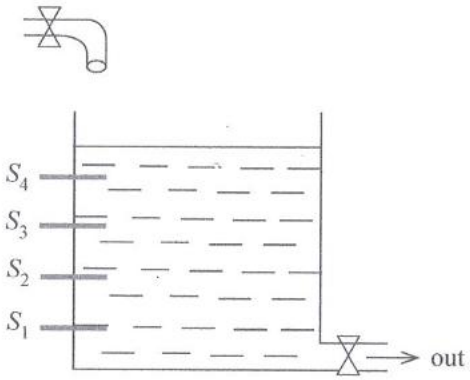
(3) A - 5 ms, 10 Hz, B - 10 ms, 100 Hz

(4) A - 100 ms, 10 Hz, B - 20 ms, 50 Hz

(5) A - 50 ms, 20 Hz, B - 100 ms, 10 Hz

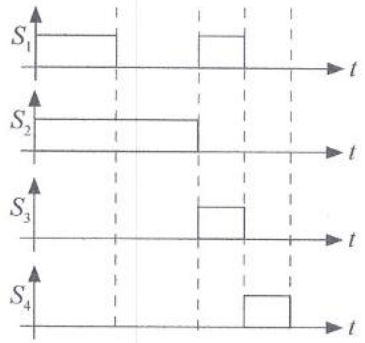
[See page fifteen

50. Following figure shows a water tank with sensors, S_1, S_2, S_3 and S_4 installed for checking the available water level. Sensors are producing logic '1' when covered by water and otherwise logic '0'.

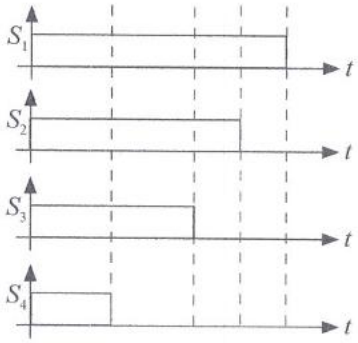


Assume that the tank is filled with water in the initial condition. Select the option that shows the continuous reducing of the water level to empty the tank. (This was happened due to the disconnection of water supply.)

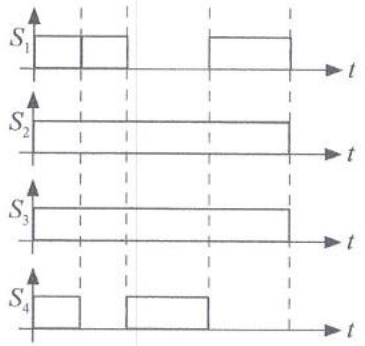
(1)



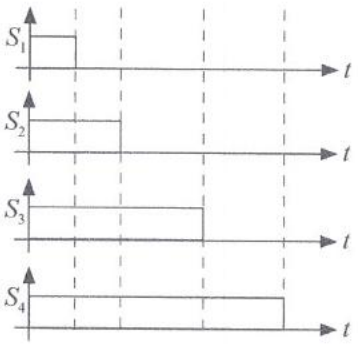
(2)



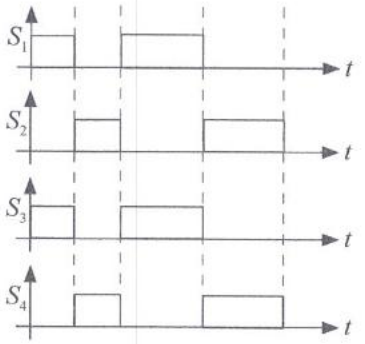
(3)



(4)



(5)



* * *

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2025
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2025
General Certificate of Education (Adv. Level) Examination, 2025

විද්‍යුලිය, ඉලෙක්ට්‍රොනික හා තොරතුරු තාක්ෂණවේදය II
மின், இலத்திரன் தகவல் தொழினுட்பவியல் II
Electrical, Electronic and Information Technology II

16 E II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index No. : .....

Important :

- *This question paper consists of* **12** *pages.*
- *This question paper comprises* ***Parts*** **A**, **B** *and* **C**. *The time allotted for* ***all parts*** *is* ***three hours***. *(Use of calculators is* ***not*** *allowed.)*

Part A - Structured Essay (08 pages)

- *Answer* ***all*** *the questions on this paper* ***itself***.
- *Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and that extensive answers are not expected.*

Part B and C - Essay (04 pages)

- *Select* ***two*** *questions from each of the parts* **B** *and* **C** *and answer* ***four*** *questions only. Use the papers supplied for this purpose.*
- *At the end of the time allotted for this paper, tie the* ***three parts*** *together so that* ***Part*** **A** *is on the top of* ***Part*** **B** ***and*** **C** *before handing over to the supervisor.*
- *You are permitted to remove only* ***Parts*** **B** ***and*** **C** *of the question paper from the Examination Hall.*

For Examiner's Use Only

Part	Q. No.	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
C	8	
	9	
	10	
Total		

Total

In Numbers	
In Words	

Code Numbers

Marking Examiner 1	
Marking Examiner 2	
Checked by	
Supervised by	

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PART A — Structured Essay

*Answer **all four** questions on this **paper itself**.*
*(Each question carries **10** marks)*

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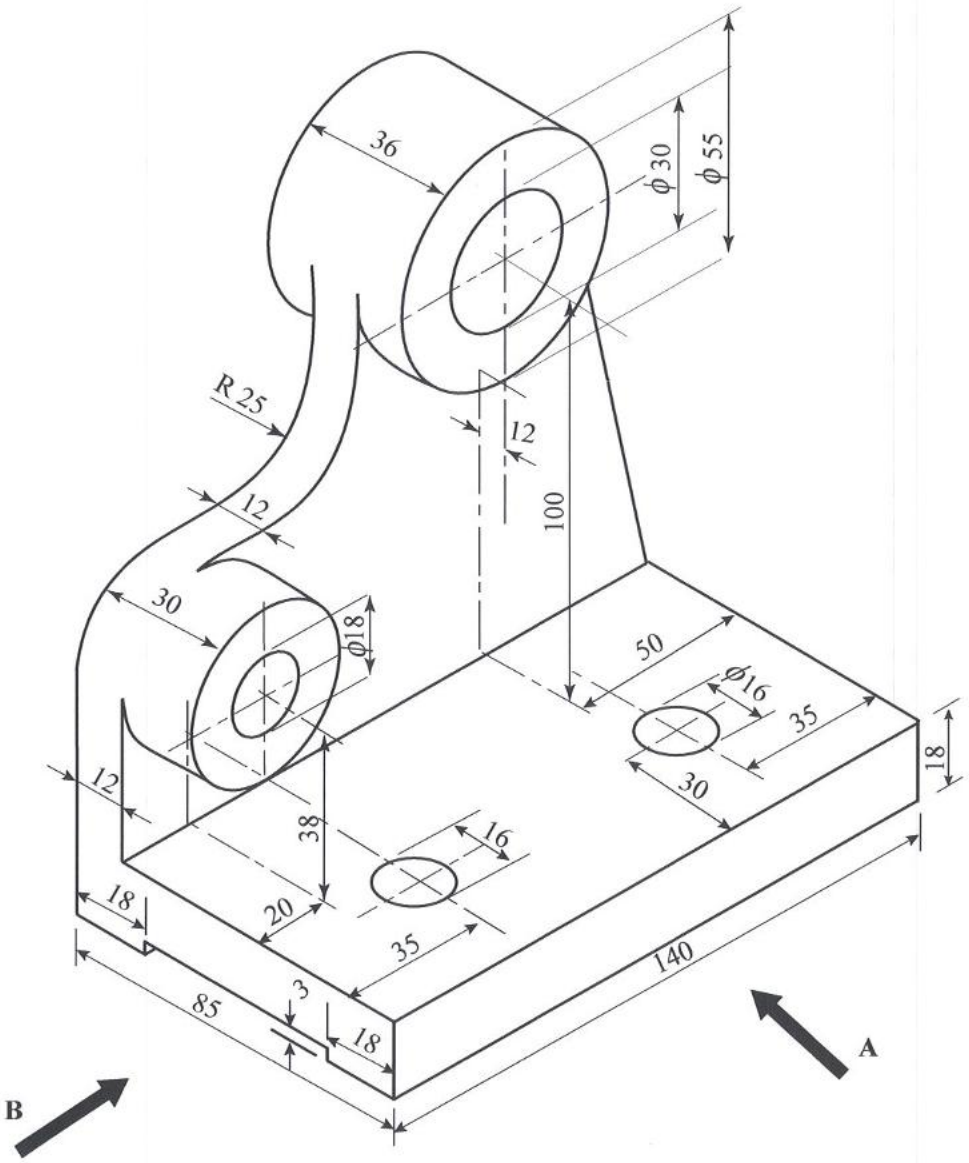
1. An isometric view of a machine component is shown in the figure. Draw the third-angle orthogonal projection views of the isometric view given in the figure using an appropriate scale and assuming missing dimensions. Indicate all relevant dimensions. Use the graph papers given on pages 3 and 4. All dimensions are in millimetres. The figure is **not** drawn into scale.



(a) Front elevation looking from **A**
(b) End elevation looking from **B**
(c) The plan view

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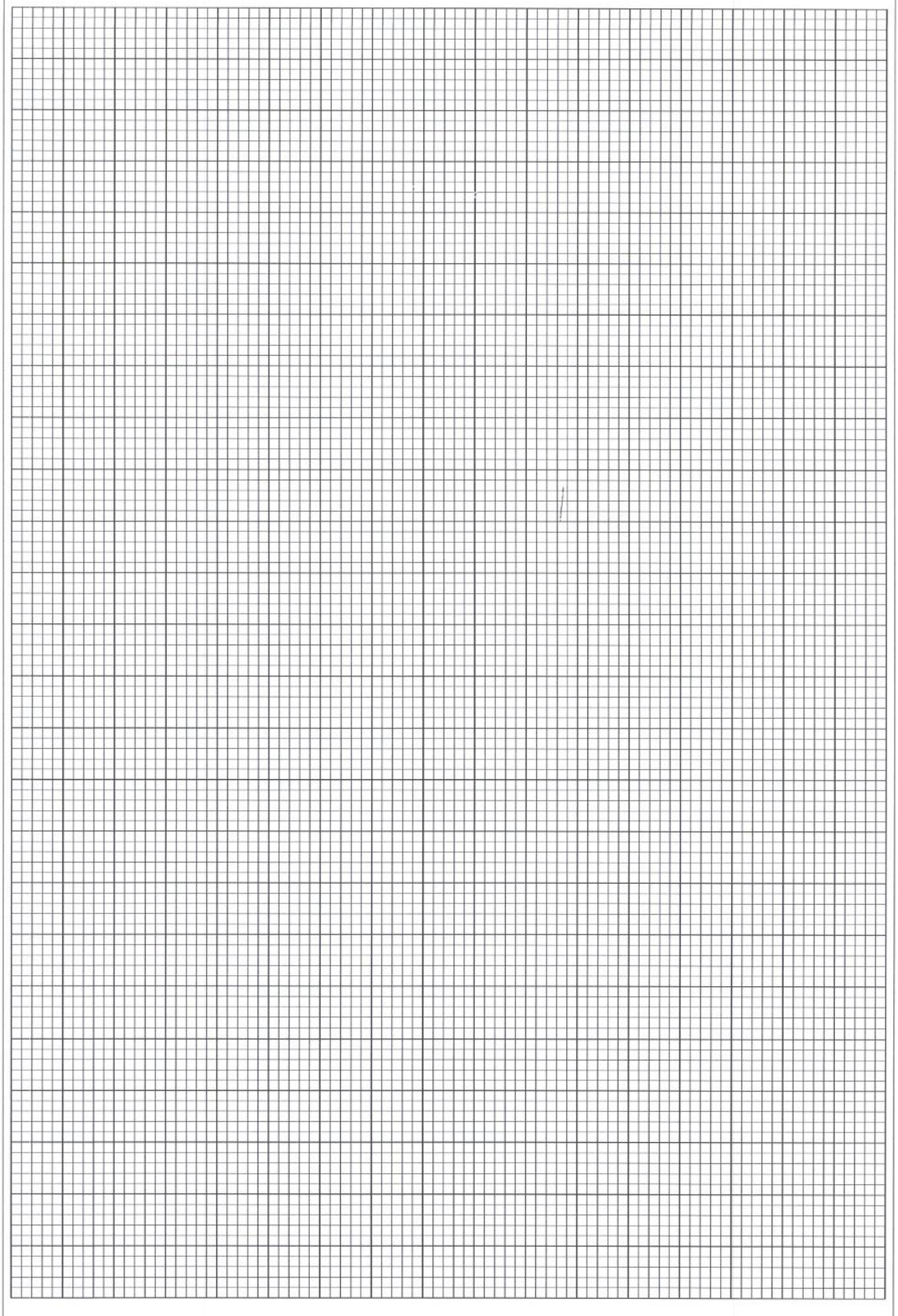

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2. An advanced level school student is planning to buy a desktop computer for his further studies.

(a) Write a specification for a desktop computer that suits for his purpose.

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(b) State **three** software for his desktop computer and their relevant purposes.

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(c) The student is planning to obtain internet facility to his desktop computer. State **two** suitable internet connection methods.

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(d) The Student is planning to follow an online course where real time interactions are required.

(i) State **two** hardware components required for this purpose.

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(ii) State a software required for attending online courses.

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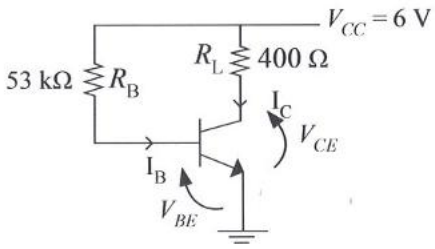
3. A simple amplifier implemented using an NPN transistor is shown below. Here, the transistor mode is, Si and β=80.



(a) What is the biasing method used in the circuit?

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(b) Assuming that V_{BE} = 0.7, determine the current I_B.

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(c) Determine the current I_C.

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(d) Determine the voltage V_{CE}.

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(e) Draw the load line for the circuit and mark the Q point.

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(f) Assume that R_B is changed to 20 kΩ. Briefly explain whether the transistor now acts as an amplifier (in other words, whether the transistor is in the active region)

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4. (a) Power transformers are used in electrical transmission and distribution systems for converting voltage levels.

(i) Sketch a transformer and label main components.

(ii) Calculate the number of turns required in secondary coil for obtaining 12 V at secondary when voltage supply is 240 V. Consider number of turns in primary as 1000.

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(iii) Evaluate what is iron loss of a transformer.

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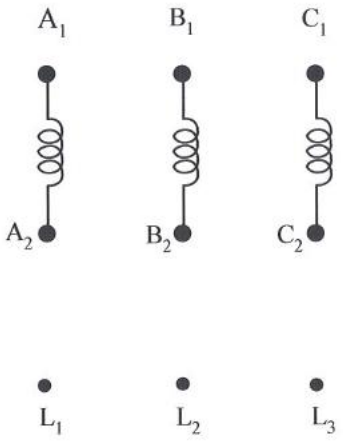
(b) Complete the wiring connection of the terminal box of delta connected 3 phase motor in following diagram.



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கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2025
General Certificate of Education (Adv. Level) Examination, 2025

විද්‍යුලිය, ඉලෙක්ට්‍රොනික හා තොරතුරු තාක්ෂණවේදය II மின், இலத்திரன் தகவல் தொழினுட்பவியல் II **Electrical, Electronic and Information Technology II**	**16 E II**

Essay

* *Select* ***two*** *questions from each of the* ***Parts*** **B** *and* **C** *and answer* ***four*** *questions only. (Each question carries* ***15*** *marks.)*

Part B

5. Many civil engineering structures have failed due to landslides in Sri Lanka in recent past. These failures have cost many human lives and economic losses.
   (a) State **two** reasons for landslides.
   (b) Explain why the landslides are most devastating natural calamity.
   (c) Explain **two** precautions that should follow when constructing houses in hilly areas.
   (d) Explain **one** precautionary measure in preparing surrounding land to prevent landslides and soil erosions in mountainous areas.

6. A team of graduates launched "ABC Leaf Eco Products", a start-up focused on producing biodegradable and compostable packaging materials using waste from the coconut industry, such as husks and coir dust. Their main goal was to provide an eco-friendly alternative to harmful single-use plastics which commonly used in hotels, restaurants and supermarkets.

   By converting agricultural waste into valuable packaging, the project supports both environmental protection and rural livelihoods. Their products quickly gained national recognition for their quality, innovation and sustainability This leads several major hotel chains and retail outlets to adopt to these products this under as a part of their green business and waste reduction initiatives.
   (a) Mention **two** innovative aspects of their products.
   (b) Analyze how entrepreneurship can promote environmental sustainability. Explain this under **three** aspects.
   (c) Describe under **two** points how the leadership and ethical qualities are used in this team.
   (d) Briefly describe **two** regional and **two** national returns expected from this project.

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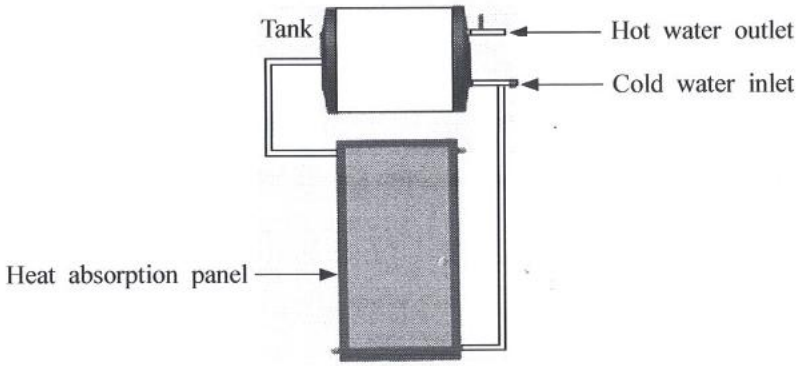


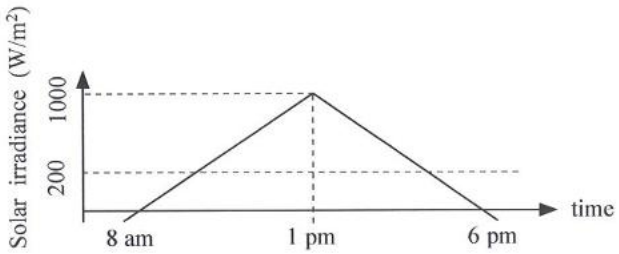
A solar water heating system is shown in the figure. Cold water enters the system and becomes hot when sunlight falls on it.

(a) Briefly describe the purpose of the cylindrical tank.

(b) Explain why the tank is installed above the solar heating panel.

(c) List **three** key factors that help the solar water heating panels to work efficiently.

(d) The following figure shows the solar irradiance (sunlight intensity) over a 10-hour period from 8.00 a.m. to 6.00 p.m.

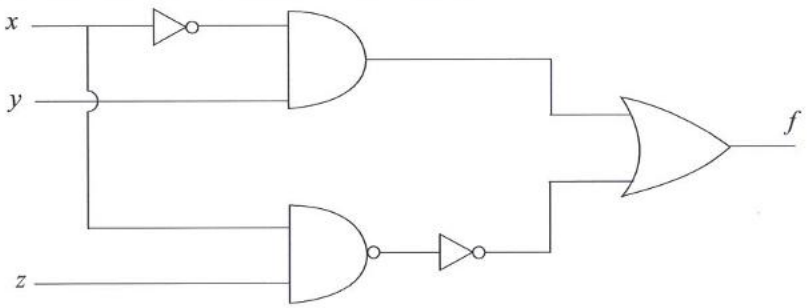


(i) If the solar hot water heater efficiency is 40%, calculate the maximum possible daily thermal energy yield in kJ/m^2.

(ii) Determine the minimum size of hot water panel area required if the tank capacity is 300 l and expected temperature of the water at night is 60 °C Take ambient temperature as 25 °C. Assume that there is no water used in daytime and neglect the heat dissipation to the environment.

Part C

8. (a) A combinational logic circuit consisting of AND, NOT, OR and NAND gates is shown below. Here, x, y and z are the inputs and f is the output.



(i) Derive the Boolean expression corresponding to the output (f) of the circuit.

(ii) Construct the truth table corresponding to the Boolean expression derived in part (i).

(iii) Briefly explain whether this circuit can be used to detect prime number between 0 and 7. (i.e, the number 2, 3, 5 and 7).

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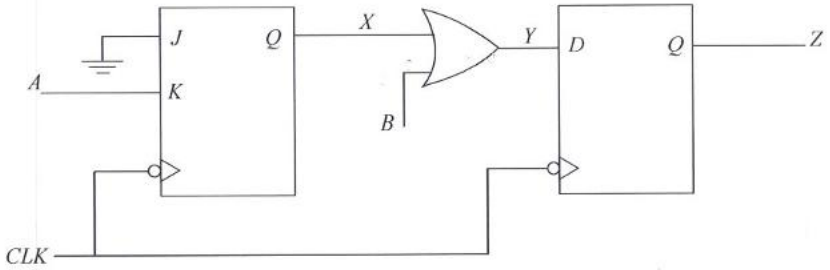
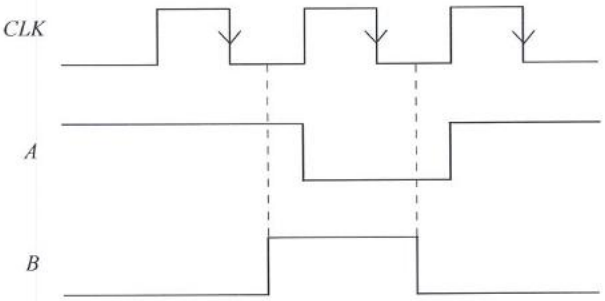
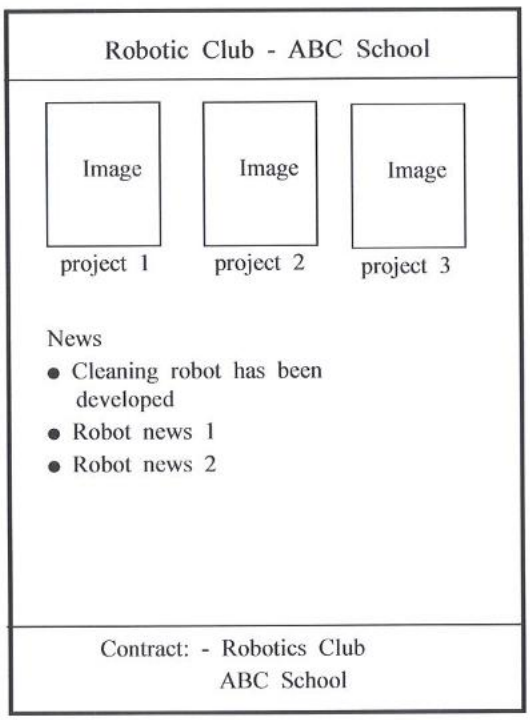
(b) (i) Draw the circuit of an *SR* flip flop using NAND gates.

(ii) A simple sequential logic circuit consisting of a *JK* flip-flop, *D* flip-flop and OR gate is shown below. Consider that both flip-flops are negative-edge triggered. Further, the initial states of both flip-flops are logic '0'. Draw the signals *X*, *Y* and *Z* for the signals *A*, *B* and *CLK* given below.





9. Assume that you are assigned to develop a website for "Robotics Club" of your school using HTML codes. The design for the front page of the web is given below.



(a) Write the programme with HTML tags.

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(b) You are requested to add links to few PDF document on following to the end of the page. Write relevant HTML tags.

(i) Proposed guidelines for a Robotic competition ("comp. pdf" file)

(ii) constitution of club Robotics ("cost. pdf" file)

(c) Write HTML codes to embed following videos to the page after news.

(i) Promotional video of last year competition ("comp.mp4"file)

(ii) youtube video on robot development

10. Domestic electrical installations are designed by following IET wiring regulations.

(a) Explain how residual current circuit breaker works for maintaining safety in electrical installations.

(b) Sketch a layout and a wiring diagram of a two way switch for a staircase.

(c) Design a ring circuit with five 13 A socket outlets. Draw wiring diagram.

(d) Determine the followings related to domestic electrical installations.

(i) How many 100 W bulbs can be fixed for 5 A circuit?

(ii) How many 15 A socket outlets can be used for 15 A circuit.

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