AL/2015/16/E-1



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

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2015 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2015 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2015

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

**16 E I**

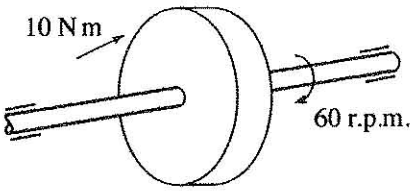
පැය දෙකයි
இரண்டு மணித்தியாலம்
***Two hours***

## Instructions:

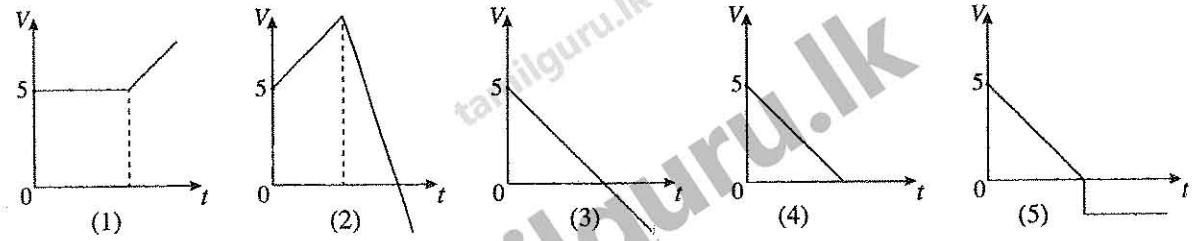
- *Answer **all** the questions.*
- *Write your **Index Number** in the space provided in the answer sheet.*
- *Use of calculators is not allowed.*
- *Instructions are given on the back of the answer sheet. Follow those carefully.*
- *In each of the questions **1** to **50**, pick one of the alternatives 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.*

1. Power, using basic units is
   (1) $kgms^2$ (2) Nm (3) $Js^{-1}$ (4) $kgm^2s^{-3}$ (5) $kgm^{-1}s$

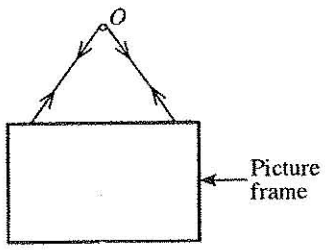
2. Figure shows a configuration of a rotor which is mounted on a shaft. The applied torque on the rotor is 10 Nm. The speed of rotation is 60 r.p.m. What is the power developed by the shaft?
   (1) $(10\pi)$ W (2) $(20\pi)$ W (3) $(30\pi)$ W
   (4) $(40\pi)$ W (5) $(50\pi)$ W




3. A boy has projected an object by a velocity of 5 $ms^{-1}$ from the height of 10 m. Which velocity-time graph represents the vertical motion of the object in air?




4. Figure shows a stable state of a picture frame which is hanging on a smooth point '$O$' by means of light string that passes through $O$.



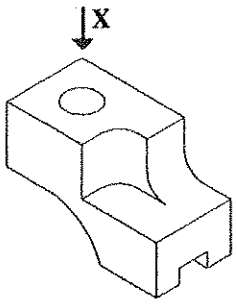

   Select the correct statement which describes the stable state.
   (1) The tension on both sides of the string is not same.
   (2) Sum of tensions on both sides of the string is equal to weight of the picture frame.
   (3) The moment of forces acting on frame about $O$ is not zero.
   (4) The net resultant horizontal component of the tension on the frame is non zero.
   (5) The line of action of weight of the picture frame passes through point $O$.

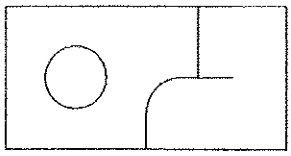
5. Solar energy is a combination of several types of energy. Some of those types are given below.
   $A$ - Heat energy $B$ - Magnetic energy
   $C$ - Light energy $D$ - Chemical energy
   Which of the above energy types are directly acquired from solar energy for **daily usage**?
   (1) $A$ and $B$ only (2) $A$ and $C$ only (3) $A$ and $D$ only (4) $B$ and $C$ only (5) $B$ and $D$ only

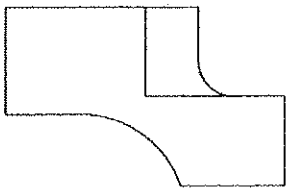


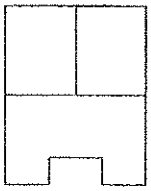
[See page two

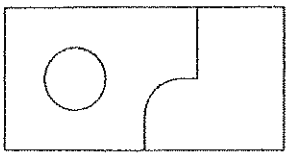
6. Isometric view of an object is given in figure below.
Which answer gives the correct view when looking from direction **X**?
(Ignore hidden lines)

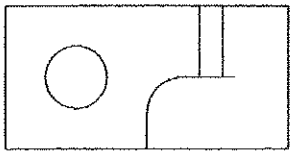




(1)

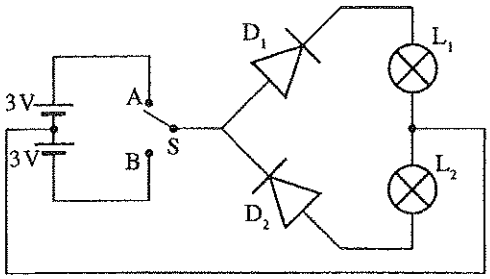

(2)


(3)

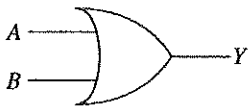

(4)

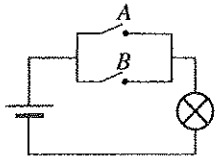

(5)

7. Figure shows a circuit used to switch on two lamps. When S switch is directed to A,
(1) only $D_1$ diode is forward biased and $L_1$ lamp is on.
(2) only $D_2$ diode is forward biased and $L_2$ lamp is on.
(3) both $D_1$ and $D_2$ diodes are forward biased and both $L_1$ and $L_2$ lamps are on.
(4) both $D_1$ and $D_2$ diodes are reversed biased and both $L_1$ and $L_2$ lamps are off.
(5) $D_1$ diode is forward biased and $L_2$ lamps is on.

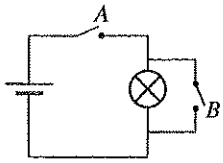



8. Select the correct circuit diagram that represents the operation of logic gate given in the Figure below.

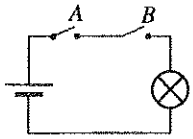


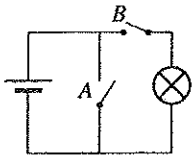
(1)



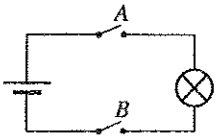
(2)



(3)

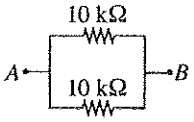


(4)

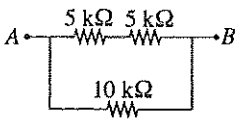


(5)

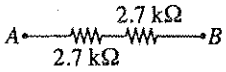
9. Which of the following resistor arrangements has the highest resistance between points *A* and *B*?



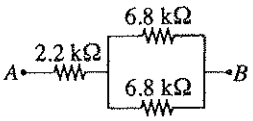
(1)



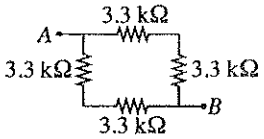
(2)



(3)

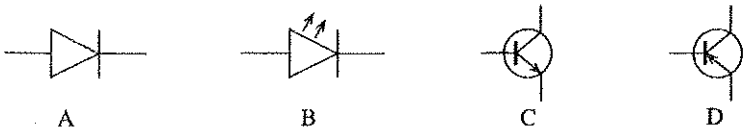


(4)



(5)

10. Select the answer which gives respectively the electronic component represented by the symbols given below.


A B C D

(1) Rectifier diode, Light emitting diode, PNP transistor, NPN transistor
(2) Light emitting diode, Rectifier diode, NPN transistor, PNP transistor
(3) Rectifier diode, Light emitting diode, NPN transistor, PNP transistor
(4) Light emitting diode, Rectifier diode, PNP transistor, NPN transistor
(5) NOT gate, Light emitting diode, NPN transistor, PNP transistor

[See page three

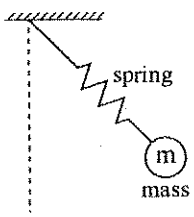
11. Following statements are related to the use of a gas cooker in a kitchen in the early morning.
*A* - Before turning the gas cooker on open the window.
*B* - Make sure gas leakages are not present.
*C* - If smell of the gas is felt do not turn on the gas cooker.
*D* - Wait till the flame to come after ignition occurs.
Which statements are correct if safety aspects are considered?
(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



12. A coconut tree slanted towards a building has been tied up by a steel wire. What is the material property that should be considered to study the breaking of the wire?
(1) Malleability. (2) Ductility. (3) Tensile strength.
(4) Elasticity. (5) Compressive strength.

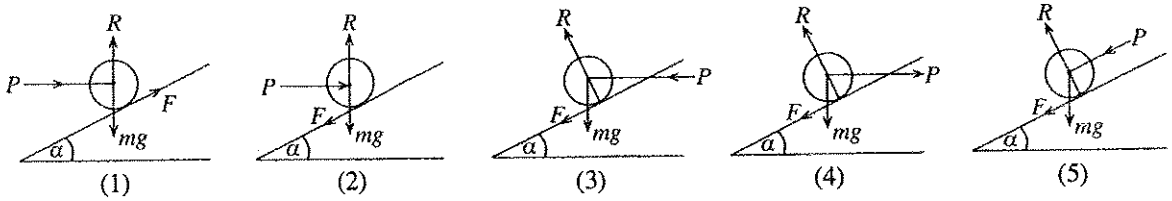
13. Frictional effect can be seen frequently in various day-to-day applications. Select the **inappropriate** statement about friction from the following statements.
(1) Friction force is proportional to the normal force.
(2) Friction is the force resisting the relative motion of two surfaces.
(3) Static and dynamic are two forms of friction.
(4) Friction force can be changed by altering surface finish.
(5) Friction always creates negative outcome for the expected result.

14. Figure shows a spring-mass system. One end of the spring is connected to a fixed point and mass m is attached at the other end. What forms of energy can be identified on the above system?
(1) Kinetic energy only.
(2) Kinetic and potential energy only.
(3) Potential and strain energy only.
(4) Kinetic, potential and gravitational energy only.
(5) Kinetic, potential and strain energy only.




15. What is the **incorrect** statement regarding mirrors and lenses?
(1) Magnifying glass is a convex lens which produces a magnified image of an object.
(2) Convex mirrors are used in side mirrors of cars to obtain narrow view of field.
(3) Concave mirrors reflect light inward to one focal point.
(4) Concave mirrors are used in vehicle headlights.
(5) Concave lenses diverge the light and always produce virtual image.

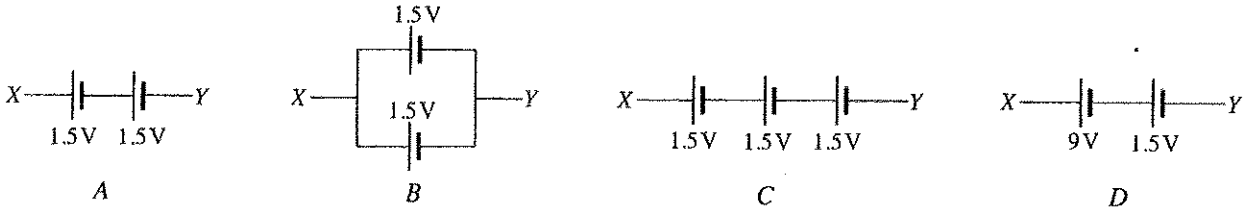
16. From the following figures, select the figure which represents the correct direction of forces, when the object tends to move in upward direction. Following notations are applied.
*R*: Reaction force, *P*: Effort, *mg*: Self weight, *F*: Friction force




17. Select the list which includes only the components used for house wiring circuits?
(1) Residual Current Circuit Breaker (RCCB), Miniature Circuit Breaker (MCB), Oscilloscope, Main Switch.
(2) Residual Current Circuit Breaker (RCCB), Miniature Circuit Breaker (MCB), Earth electrode and Earth wire, Main Switch.
(3) Earth electrode, Main switch, Lamp holders and Lamps, Oscilloscope.
(4) Main switch, Miniature Circuit Breaker (MCB), Multimeter, Oscilloscope.
(5) Residual Current Circuit Breaker (RCCB), Main switch, Socket outlets, Transistors.

[See page four

18. Consider the following battery arrangements.




Select the answer that gives the total voltage between $XY$ of the circuit in ascending order.

(1) $A, B, C, D$ (2) $A, C, D, B$ (3) $A, D, C, B$ (4) $B, A, C, D$ (5) $D, C, B, A$

19. Which of the following statements are true about the density of a matter?

$A$ - It depends on the concentration of its atoms. $B$ - It does not change with pressure.
$C$ - It changes with its phase. $D$ - It changes with temperature.

Which of the above statements are true?

(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

20. Which of the following statements correctly explains the centre of gravity of an object?

$A$ - Centre of gravity of an object always lies within the object.
$B$ - Stability of an object increases when centre of gravity goes down.
$C$ - Centre of gravity of an object in neutral equilibrium does not change.
$D$ - Centre of gravity of an object can be determined by hanging the object from its different locations.

(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

21. Select the situation/s in which friction force becomes useful?

$A$ - Applying brake in a moving vehicle.
$B$ - Climbing a tree.
$C$ - Skating on snow.

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

22. What are the correct statements about energy?

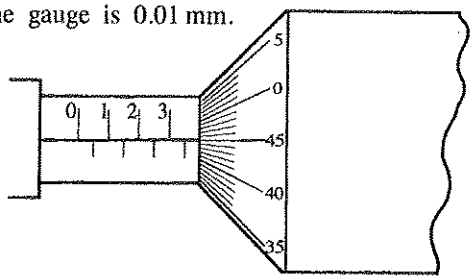
$A$ - Energy can be stored in an object in the form of potential, kinetic or strain energy.
$B$ - Potential energy is used in hydro power generation.
$C$ - Kinetic energy is used in wind power generation.
$D$ - Strain energy is used in leaf springs of vehicles.

(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

23. Figure shows the measurement of a work piece measured from a micrometer screw gauge. The micrometer screw gauge has **no** zero error. The least count of the gauge is 0.01 mm.

Indicated reading is

(1) 3.45 mm.
(2) 3.40 mm.
(3) 3.30 mm.
(4) 3.95 mm.
(5) 4.00 mm.




24. You are standing in a bus which is moving at a certain speed. What is the force acting on your body, only when the bus is passing a bend?

(1) Centrifugal force (2) Centripetal force (3) Impact force
(4) Friction force (5) Gravitational force

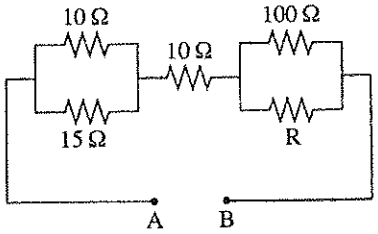
25. An entrepreneur should

(1) always accept challenges.
(2) have minimum understanding of relevant market.
(3) make less attention to manage resources and time.
(4) not study about the business competitors.
(5) take minimum risk.



[See page five

26. The total resistance between AB of following circuit is 66 Ω. What is the correct colour code of resistor R?

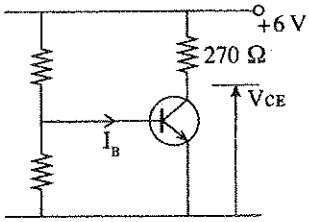



(1) Brown, Black, Black
(2) Brown, Black, Brown
(3) Brown, Yellow, Brown
(4) Yellow, Black, Black
(5) Orange, Black, Black

27. What is the correct type of switch for controlling a lamp in a staircase from two separate locations?
(1) Single pole single throw (S.P.S.T.) switch (2) Single pole double throw (S.P.D.T.) switch
(3) Double pole single throw (D.P.S.T.) switch (4) Double pole double throw (D.P.D.T.) switch
(5) Normally open (N/O) push button

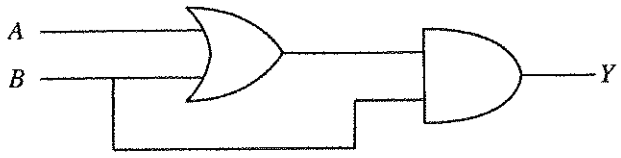
28. Select the answer which include parameters that can be measured directly from a waveform observed by an oscilloscope.
A - Peak value of the voltage of an alternating current (AC) supply
B - R.M.S. (root mean square) value of the voltage of an AC supply
C - Resistance value of a resistor
D - Voltage of a Direct Current (DC) supply
E - Capacitance of a capacitor
F - Period of an AC supply
(1) A, C and E (2) A, D and E (3) A, D and F
(4) B, C and E (5) B, D and E

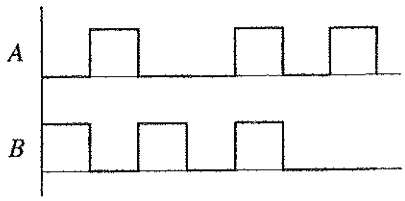
29. Following figure shows a circuit with a transistor biased in common emitter configuration. Collector-emitter voltage, $V_{CE}$ = 3.3 V and base current, $I_B$ = 0.1 mA. What is the approximate value of current gain?

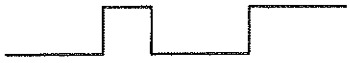



(1) 10 (2) 50
(3) 100 (4) 120
(5) 200

30. What is the output of following logic circuit when inputs *A* and *B* are given?

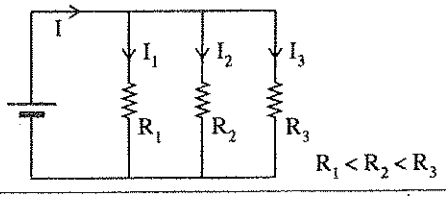


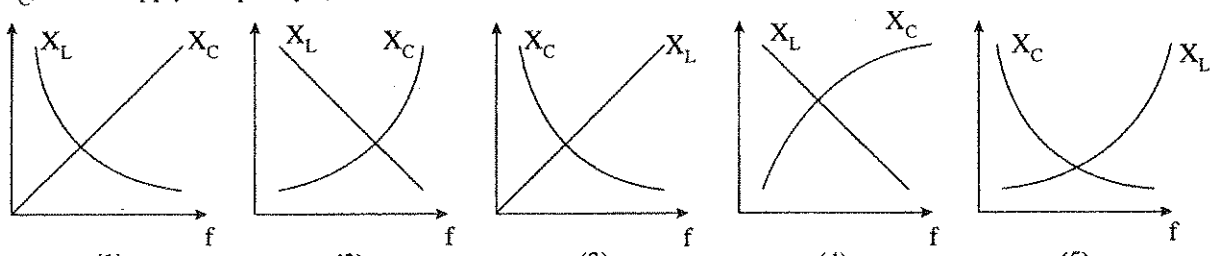

(1) 
(2) 
(3) 
(4) 
(5) 

31. What are the required multiplication factors for both length and width of the parallel plates in a parallel plate capacitor to increase the capacity by 4 times?
(1) 4 (2) 2 (3) $\frac{1}{2}$ (4) $\frac{1}{4}$ (5) $\frac{1}{8}$

32. What is the correct statement regarding currents in the following circuit?
A: $I = I_1 + I_2 + I_3$ B : $I = I_1 = I_2 = I_3$
C: $I > I_1 > I_2 > I_3$ D : $I_1 < I_2 < I_3 < I$
(1) *A* only (2) *B* only
(3) *A* and *B* only (4) *A* and *C* only
(5) *A* and *D* only

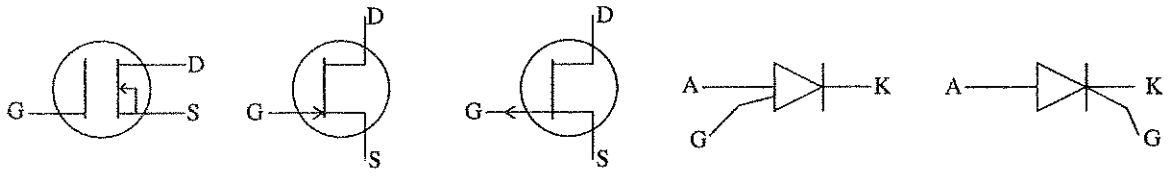


33. What is the correct graph that represents the variation of inductive reactance ($X_L$) and capacitive reactance ($X_C$) with supply frequency (f)?




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

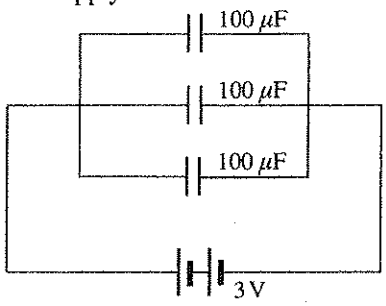
34. What is the correct symbol used for N-channel junction field effect transistor (JFET)?



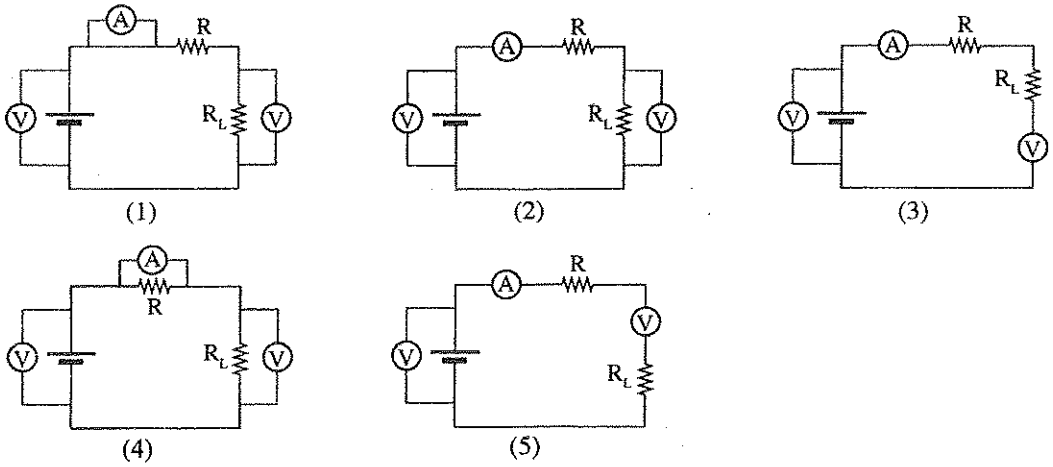

(1) (2) (3) (4) (5)

35. Consider the following connection of 100 $\mu$F capacitors to a 3V DC power supply. Calculate amount of charge stored in the capacitor bank.

(1) 0.1 mC (2) 0.3 mC
(3) 0.9 mC (4) 1.8 mC
(5) 2.7 mC




36. Two voltmeters and an ammeter are connected to a DC circuit to measure the supply voltage of the DC source, voltage across the resistive load ($R_L$) and the circuit current. Select the correct circuit arrangement.




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

37. Consider following statements related to tariff types and meters used in the electric power supplies.

A - Only energy meter (kWh meter) is used in domestic power supplies for measuring the energy consumption.
B - Both energy meter (kWh meter) and maximum demand meter (kVA meter) are used for industrial users to measure normal energy consumption (kWh) and maximum demand value (kVA).
C - Different tariff types such as flat rate, block rate, day and night tariff, two-part tariff are used in calculating the monthly bill for the electricity consumption.

The correct statement(s) from the above is/are

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

[See page seven

38. Following Table shows the details of the conductors available in a laboratory.

| Conductor | Resistivity (Ωm) | Cross section area ($m^2$) | length (m) |
|---|---|---|---|
| A | $\rho$ | $a$ | $l$ |
| B | $\rho$ | $\frac{1}{2}a$ | $l$ |
| C | $\rho$ | $a$ | $3l$ |
| D | $4\rho$ | $a$ | $l$ |
| E | $4\rho$ | $a$ | $2l$ |

Select the correct answer with ascending order of the resistance value of the conductors.

(1) A, B, C, D, E (2) B, C, D, E, A (3) C, D, E, A, B
(4) D, C, A, B, E (5) E, D, C, B, A

39. Consider following statements related to three phase induction motors.

A - Magnetic field produced by the stator winding, is rotating at synchronous speed when it is connected to three phase AC supply.
B - There are two methods of connecting stator winding as star and delta.
C - Can change the direction of rotation by interchanging the supply connections of two phases.

The correct statement(s) from the above is/are

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

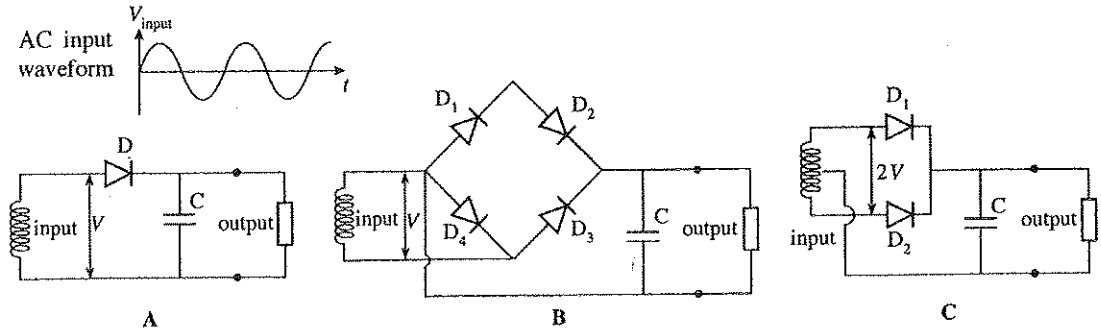
40. Consider following statements regarding transmission of electro-magnetic waves for radio and television.

A - Amplitude modulation (AM) is used in transmission of signals for radio and the electro magnetic waves are in frequency band from 525 kHz to 1625 kHz.
B - Frequency modulation (FM) is used in transmission of signals for radios and the electro-magnetic waves are in frequency bands from 88 MHz to 108 MHz.
C - Very high frequency (VHF) and ultra high frequencies (UHF) are utilized for transmission of TV signals.

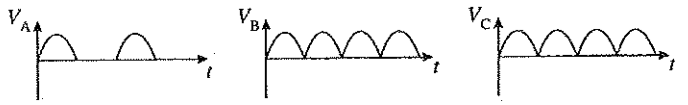
The correct statement(s) from the above is/are

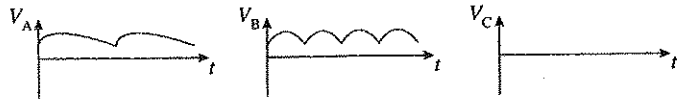
(1) A only. (2) B only. (3) C only. (4) A and C only. (5) A, B and C all.

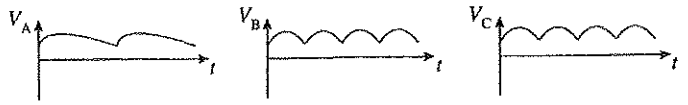
41. Following figure shows rectifier circuits constructed by a student. Assume that each circuit is connected to an AC power supply and observed the output waveform by an oscilloscope.

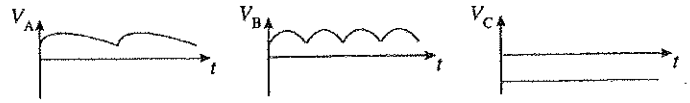


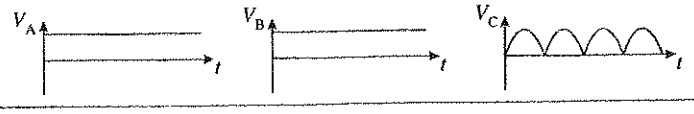

Select the answer with correct set of output waveforms.

(1)



(2)



(3)


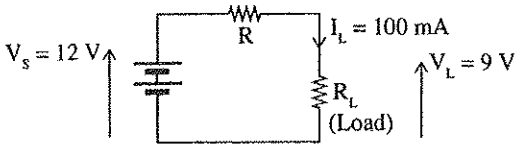

(4)



(5)



[See page eight

42. Following circuit shows a use of series resistance, R, for obtaining low voltage supply for a load ($R_L$)from a DC supply with higher voltage value. Assume that the supply voltage is 12 V and the required voltage at load is 9 V. Load will consume 100 mA. Select the answer with correct ratings for the resistor R.

(1) 30 Ω / 0.3 W (2) 30 Ω / 1.5 W
(3) 300 Ω / 0.15 W (4) 3 Ω / 1.5 W
(5) 10 Ω / 1 W



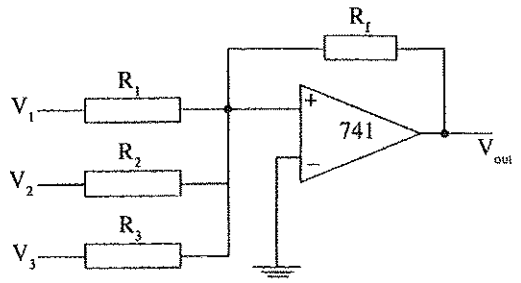

43. Following circuit shows a use of operational amplifier as an adder circuit. Here, $R_f = R_1 = R_2 = R_3$.

Output voltage ($V_{out}$),

(1) $-V_1 \cdot V_2 \cdot V_3$ (2) $-(V_1 + V_2 + V_3)$

(3) $+(V_1 + V_2 + V_3)$ (4) $-\left(\frac{1}{V_1} + \frac{1}{V_2} + \frac{1}{V_3}\right)$

(5) $+\left(\frac{1}{V_1} + \frac{1}{V_2} + \frac{1}{V_3}\right)$




44. Most of the large scale hydro power plants in Sri Lanka are medium head ones. Select the mostly used turbine type in large scale hydro plants.

(1) Pelton turbine (2) Francis turbine (3) Kaplan turbine
(4) Propellor turbine (5) Pelton, Francis and Kaplan turbines

45. Consider following statements regarding computer networks.

A - Enhance the data transfer capacity between computers in the network.
B - Possible to share the resources among the network.
C - Centralised software management and reduced cost for software.
D - Reduced security to the computers.

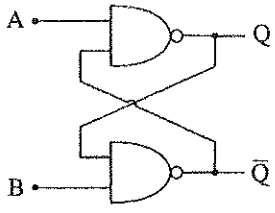
Select the answer with correct statement(s).

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

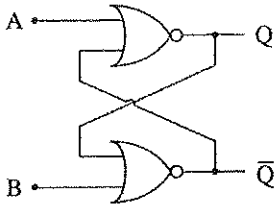
46. Several statements related to computer hardware/software and examples for them are given below. Choose the answer which has a **mismatch** between computer hardware/software and the given examples.

(1) Input/output device : keyboard, mouse, monitor
(2) Computer operating system : DOS, Windows, Linux
(3) Application software : MS Office, AutoCAD, Photoshop
(4) Computer Programming Language : Java, C++, Visual Basic
(5) Virus guard software : firewall, Noton antivirus software, email

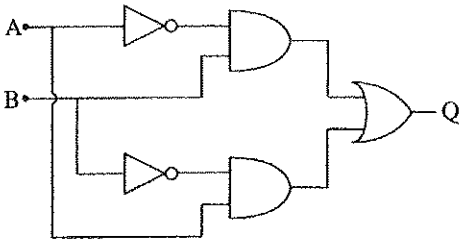
47. Following figure shows a set of logic circuits



(x)



(y)



(z)

Select the answer with correct logic circuit.

(1) x - SR flip-flop using NOR gates
y - SR flip-flop using NAND gates
z - JK flip-flop

(2) x - SR flip-flop using NAND gates
y - SR flip-flop using NOR gates
z - XOR gate

(3) x - JK flip-flop using NAND gates
y - JK flip-flop using NOR gates
z - XOR gate

(4) x - JK flip-flop
y - SR flip-flop
z - XOR gate

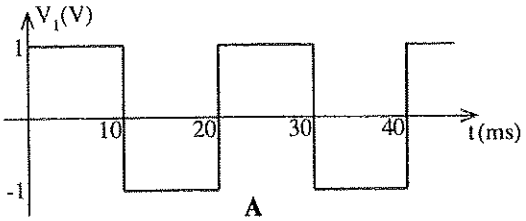
(5) x - JK flip-flop using NOR gates
y - JK flip-flop using NAND gates
z - XOR gate

[See page nine

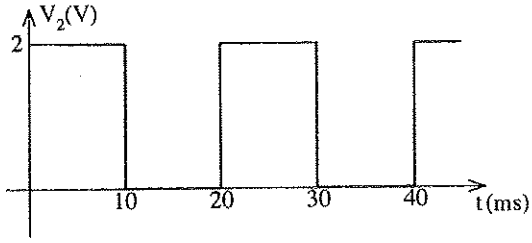
48. Consider following statements regarding information, information transmission and usage.
A - Raw data can be converted to information by data processing using information technology.
B - Computer networks cannot be used for transmission of information.
C - Examples for computer based information systems are transactions processing systems of banks, decision support systems and expert systems.
Select the answer with correct statement(s).
(1) A only (2) B only (3) A and B only
(4) A and C only (5) A, B and C all

49. A board which is **not** used for construction of electronic circuits is
(1) Project board (bread board). (2) Dotted vero board.
(3) Strip vero board. (4) Printed circuit boards (PCBs).
(5) Panel boards.

50. Two square waveforms are given below.



A



B

Select the answer with correct values for average voltage value, period and frequency respectively.
(1) A - 0 V, 20 ms, 50 Hz
B - 1V, 20 ms, 50 Hz
(2) A - 1 V, 10 ms, 100 Hz
B - 2 V, 10 ms, 100 Hz
(3) A - 0 V, 10 ms, 50 Hz
B - 1 V, 10 ms, 50 Hz
(4) A - 2 V, 20 ms, 100 Hz
B - 2 V, 20 ms, 100 Hz
(5) A - 0 V, 10 ms, 100 Hz
B - 0 V, 20 ms, 50 Hz

* * *

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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2015 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2015 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2015

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| විදුලිය, ඉලෙක්ට්‍රොනික හා තොරතුරු තාක්ෂණවේදය II<br>மின், இலத்திரன் தகவல் தொழினுட்பவியல் II<br>**Electrical, Electronic and Information Technology II** | **16 E II** | පැය තුනයි<br>மூன்று மணித்தியாலம்<br>***Three hours*** |

**Index No. :** .....

**Important :**

- *This question paper consists of **10** 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 (07 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 (03 pages)

- *Select minimum of **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 | 1 | |
| | 2 | |
| | 3 | |
| C | 4 | |
| | 5 | |
| | 6 | |
| Total | | |
| Percentage | | |

**Final Marks**

| | |
|---|---|
| In Numbers | |
| In Words | |

**Code Numbers**

| | |
|---|---|
| Marking Examiner 1 | |
| Marking Examiner 2 | |
| Checked by | |
| Supervised by | |

[see page two

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**PART A – Structured Essay**

*Answer **all four** questions on this **paper itself**.*

*(Each question carries **10** marks)*

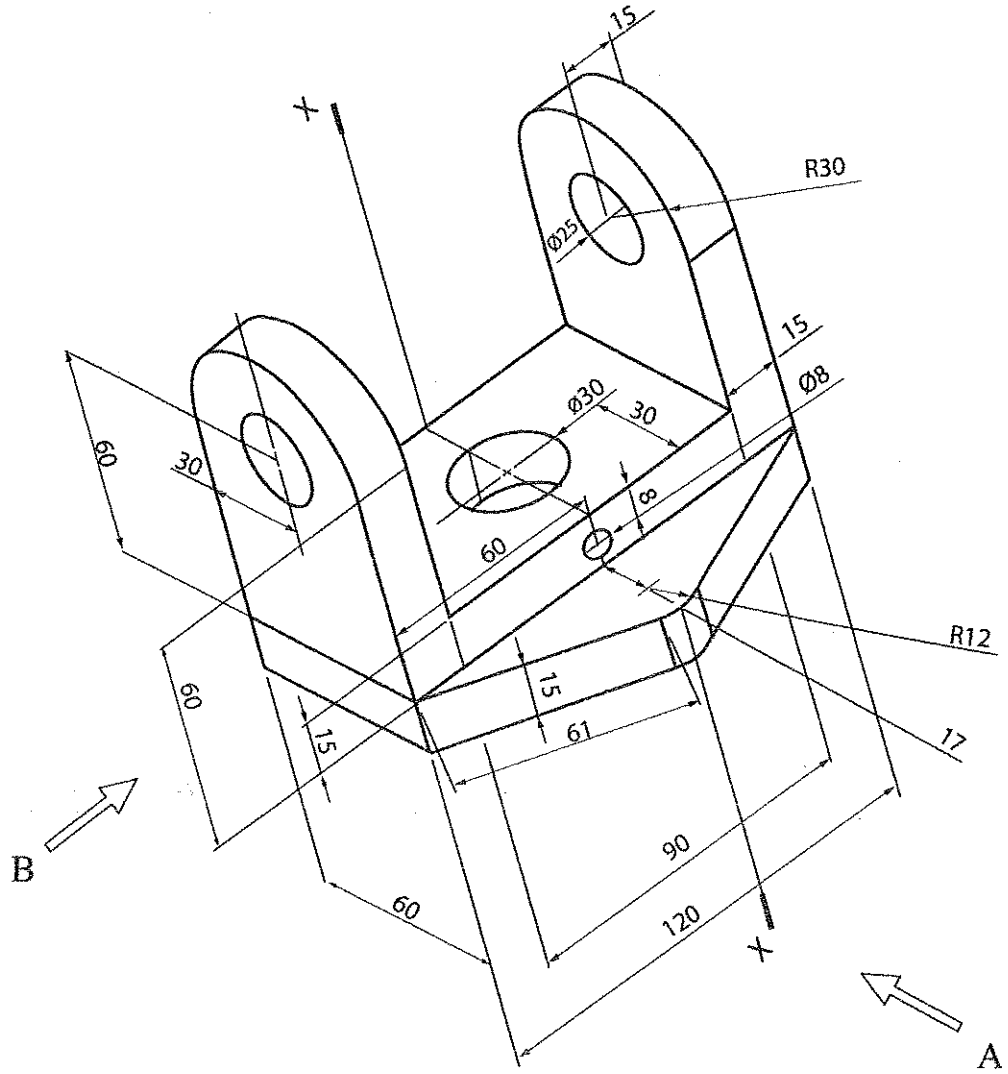
1. An isometric view of a machine component is shown in the figure. The centre hole ($\phi$30) passes completely through the component. Machine component is symmetric along the vertical plane passing through **X–X**. Assuming any missing dimensions, draw the following to a suitable scale using first angle projection principle.

   (a) Front elevation seen through direction **A**

   (b) End elevation seen through direction **B**

   (c) Plan

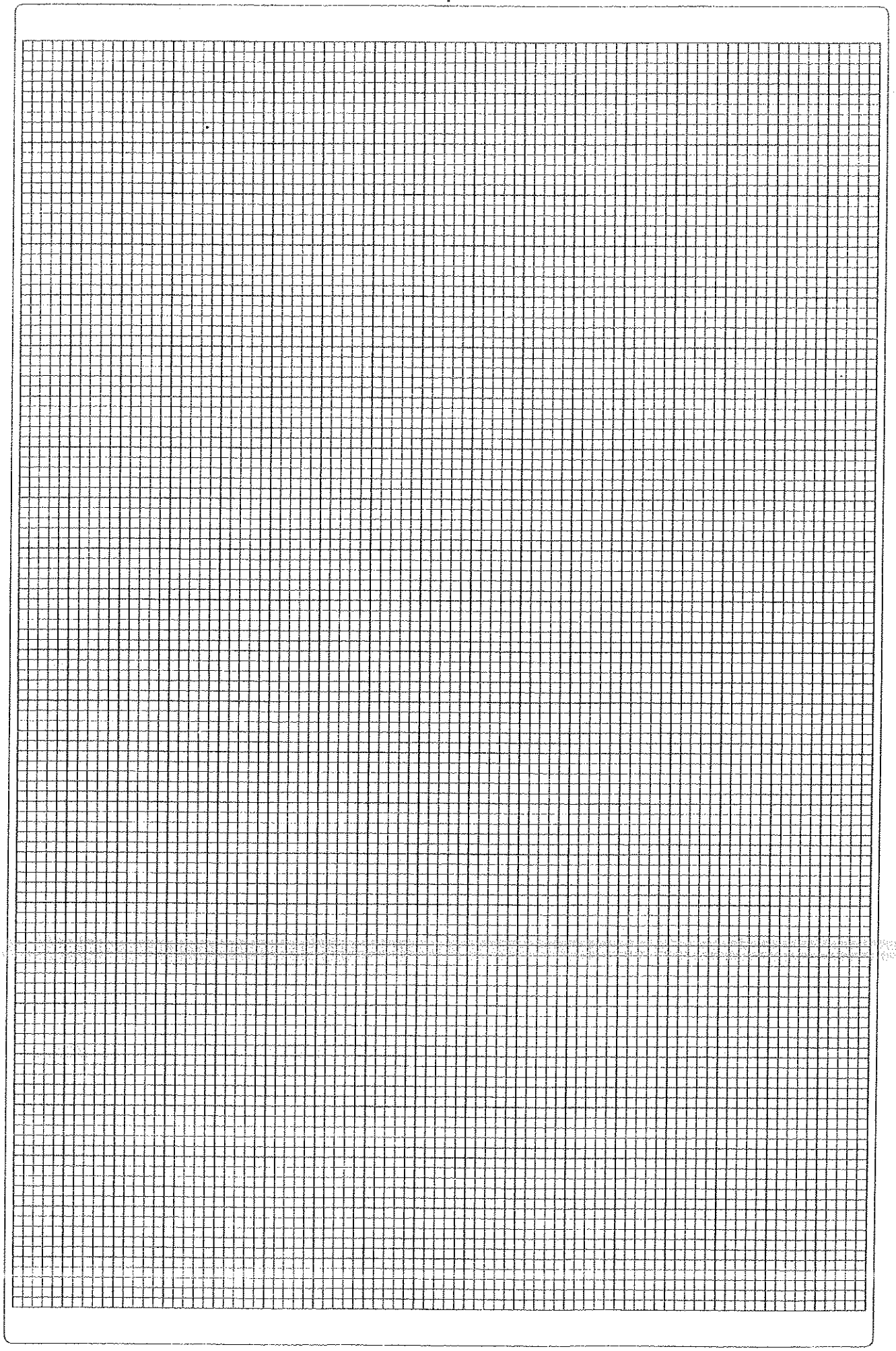
   Show dimensions in the sketches. Use the graph papers given on page 3 and 4 to answer the question. (All dimensions are in mm.)






*[see page three*

[see page four



[see page five

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2. Assume that you are appointed as an IT trainee manager of a hotel. Previously the hotel management has planned to establish a conference room, computer centre and wireless internet facilities in hotel premises. Assume that the previous project proposal is not available now. However, following list of items have already been purchased.

- System units
- Mouse
- Keyboards
- Monitors
- Printers
- Multimedia projector
- Network switches and cables
- Windows operating system
- Microsoft office package

(a) From the purchased items, list hardware and software items seperately.

Hardware : .....

.....

.....

.....

Software : .....

.....

.....

.....

(b) Proposed computer centre will be used for various customer needs, such as preparing documents, presentations, accessing internet and processing photos.

(i) List **three** essential items required to prepare a fully functional computer from available hardware.

1. .....
2. .....
3. .....

(ii) State, from available hardware, a hardware required to create a computer network for the computer centre.

.....

.....

.....

.....

(iii) Identify **two** software requirements for the computer centre in addition to the available ones.

1. .....
2. .....

(c) Proposed conference room will be used for special events, meetings and presentations.

(i) Identify a hardware required for the conference room from the available list.

.....

.....

(ii) Assume that the hotel management decided to have facilities for video conferencing in the conference room. Identify **two** hardware units and a software required for this purpose.

Hardware units

1. .....
2. .....

Software

1. .....

(d) List a hardware item required to purchase to provide the wireless internet facilities.

.....

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.....

*[see page six*

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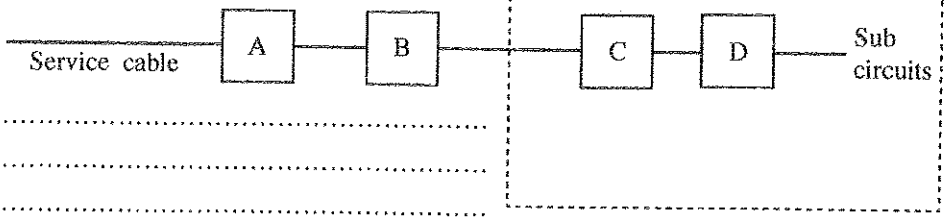
3. Following main components are used in a house wiring circuit.

Main switch
Energy (kWh) meter
Residual current circuit breaker (RCCB)
Service fuse

(a) Identify the corresponding components from following block diagram of a house wiring circuit.




A - .....

B - .....

C - .....

D - .....

(b) What are the cable sizes suitable for 5A and 15A sub circuits according to the IET Wiring Regulations.

Cable type for 5A sub circuit : .....

.....

Cable type for 15A sub circuit : .....

.....

(c) Assume that five lamps in a long corridor should be operated from two switches in both ends and one in middle of the corridor.

(i) State the most suitable types of switches for this application.

.....

.....

.....

.....

.....

(ii) Draw the wiring diagram for the circuit.



[see page seven

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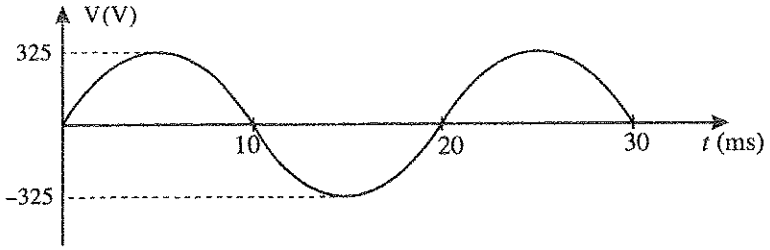
4. Following figure shows a sinusoidal signal obtained by measuring main AC supply by uisng an oscilloscope.




(a) (i) Calculate the r.m.s. (root mean square) value of the AC supply.

.....

.....

.....

.....

(ii) Find the frequency of the supply.

.....

.....

.....

.....

(b) Assume that an electric motor is connected to the main AC supply as a load. Assume V - supply voltage, I - supply current, $\cos\phi$ - power factor.

(i) Write equations for active and reactive power consumed by the motor.

.....

.....

.....

.....

(ii) Draw a phasor diagram to represent the active power and reactive power consumed by the motor.

(iii) State a method to improve the power factor of the load.

.....

.....

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*[see page eight*

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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2015 අගෝස්තු
கல்விப் பொதுத் தராதர பத்திர (உயர் தர)ப் பரீட்சை, 2015 ஓகஸ்ற்று
General Certificate of Education (Adv. Level) Examination, August 2015

විදුලිය, 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.*
*(Give concise answers. Sketch clear figures and label them where necessary.*
*(Each question carries **15** marks.)*

## Part B

1. The famous quote about energy is "Energy cannot be created or destroyed". However, energy can be transformed from one form to another. Different types of machines are used to transform energy into useful forms.
   (a) List **five** natural energy sources and state the basic form of energy stored in each source.
   (b) During energy transformation process, losses are inevitable. Briefly describe **three** reasons for energy losses during transformation process.
   (c) Efficiency of the energy transformation process depends on amount of losses in the process. High efficiencies can be guaranteed by reducing the amount of losses. State, how you minimize the energy losses in following processes.
      (i) Power generation at hydro-power plant
      (ii) Use of refrigerator at home
      (iii) Use of electric iron at home
   (d) Demand for energy is continuously increasing in the present society. However, some energy sources are scarce. Therefore, in the present context, different techniques have been implemented to popularize efficient use of energy. The energy club at your school has planned to organise a programme to make the community aware about the efficient use of energy.
      (i) Briefly explain **two** techniques that can be implemented to popularize efficient use of energy.
      (ii) Explain **two** facts you will discuss in the programme about the efficient use of energy in the following areas.
         1. Transportation
         2. Infrastructure development in public areas

2. Technology is very important in the present context in order to improve the quality of human life. Therefore, the influence of technology developments are widespread across the country. Three important areas; civil technology, mechanical technology and electrical, electronics and information technology are identified as some of the key technological areas for today's need. As a student who is following technology stream in advanced level, you have a social responsibility of making the community aware about the technological development in above areas.
   (a) State **three** benefits of making the community aware about the technology developments in above three areas.
   (b) Give **two** types of resources which can be used to make your community aware of the benefits of utilizing technology. Briefly explain how the mentioned resources are utilized for the purpose.
   (c) How do you overcome the resistance of community for the use of technology in identified areas?
   (d) Briefly explain **two** methods to get the attention of authorities (government/non-government) in order to popularize the use of technology in your community.

*[see page nine*

3. In a road development project of a city, it is expected to redesign the existing road and pavement system to smoothen the current traffic flow and to ensure the safety of pedestrians.

   (a) It is reported that many accidents happen due to cyclists in this city. Explain **one** suggestion to solve this issue in the road development project.

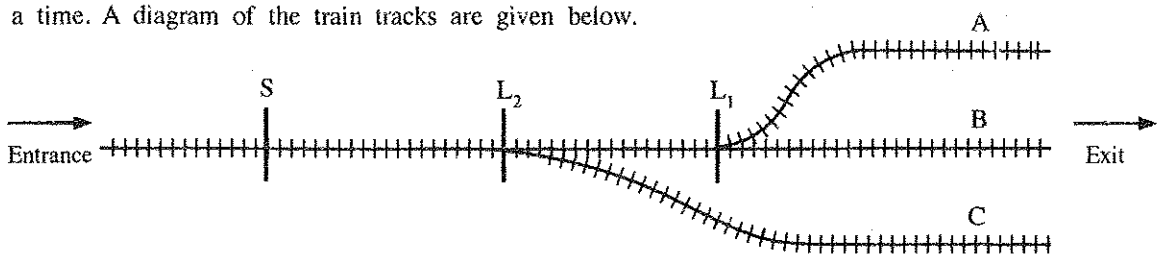
   (b) Propose **two** methods that can be adopted at junctions in order to ensure the safety of blind people.

   (c) Describe **two** methods to reduce the traffic congestion at the junction in the redesign process.

   (d) It has been found that use of personal vehicles is a major factor contributing to traffic congestion in the city. Propose **three** methods to discourage the use of personal vehicles.

## Part C

4. Assume that you are requested to develop a logic circuit for activating the signals and operating the lever for changing the train tracks in deciding the way for a train in a station where three trains can be stopped at a time. A diagram of the train tracks are given below.




Here, S - Red signal for blocking the entrance $L_1$ - Lever for track B, $L_2$ - Lever for track C.

The availability of a train in a track is indicated by sensors fixed in A, B and C tracks. These sensors give logic level 1 when there is a train in the track. In addition, S, $L_1$ and $L_2$ are the outputs and when the corresponding logic levels are 1, $L_1$ and $L_2$ livers will be operated and the S signal will be on. The system should operate under following conditions.

- Incoming train should reach track A without operating any levers when track A is free.
- Incoming train should reach track B by operating $L_1$ lever when track A is occupied by a train.
- Incoming train should reach track C by operating $L_2$ lever only when both A and B are occupied by trains.
- When all three tracks are occupied by trains, entrance to the station should be blocked by operating red signal S.

(a) Prepare the truth table for A, B and C inputs and S, $L_1$ and $L_2$ outputs. Mention the logic state for each output separately.

(b) Write boolean expressions for each output (S, $L_1$ and $L_2$) separately.

(c) Draw the logic circuit for the above mentioned operation by using logic symbols.

(d) Assume that the levers are operated by electric motors. Draw a diagram of a mechanism for operating motors based on the outputs of the logic circuit. Representing only one lever is adequate.

5. Assume that the administration of your educational institute has decided to establish a computer laboratory with 50 desktop computers with Internet facilities.

(a) A computer network will be established in the proposed computer laboratory. State **three** possible configurations (topologies) for the network.

(b) (i) List **two** types of network cables that can be used for the computer network.

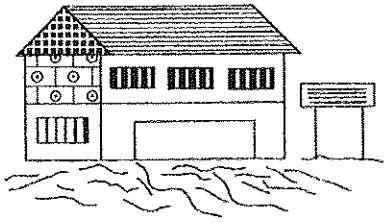
(ii) State another **two** hardware items required for the computer network except the computers and cables mentioned in part (b) (i).

*[see page ten*

(c) The educational institute decided to develop a web page for the laboratory. Assume that you are requested to develop the following web page with the title of 'computer laboratory - educational institute' as the initial step. Write the program with HTML tags to create the web page.

# Computer Laboratory

*Educational Institute*



Computer systems laboratory will be established for the use of students

- Facilities for accessing internet
- Computer network and resource sharing
- Software for student work

**Contact:**

Mr. Coordinator Lab

Tel : 001-0000000

6. A time varying magnetic field will be generated when a changing current is passed through a conductor coil. An electro motive force (emf) will be induced if another coil is placed in the time varying magnetic field. This is stated as a law.

(a) (i) What is the name of the induction happen in above mentioned situation?

(ii) State one electric equipment developed for controlling (reduce or increase) AC voltage based on this principle.

(b) (i) Mention **two** types of the equipment mentioned in part (a) (ii) based on the voltage supplied to first coil compared to second one of the above mentioned coils.

(ii) Draw the symbol of one equipment mentioned in part (i) and label the components.

(c) Assume that the equipment mentioned in (a) (ii) is ideal. 2A current under 25V voltage is taken as the output from second coil by supplying 250V AC supply to the first coil. Calculate the current in first coil.

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