

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

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2017 අගෝස්තු
 கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2017 ஓகஸ்ட்
 General Certificate of Education (Adv. Level) Examination, August 2017

සිවිල් තාක්ෂණවේදය I
 குடிசார்த் தொழினுட்பவியல் I
 Civil Technology I

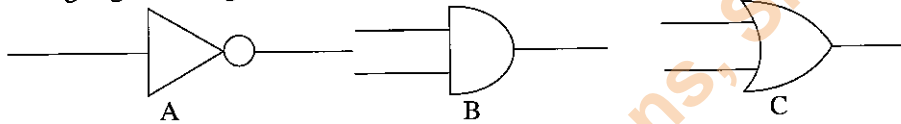
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පැය දෙකයි
 இரண்டு மணித்தியாலம்
 Two hours

Instructions:

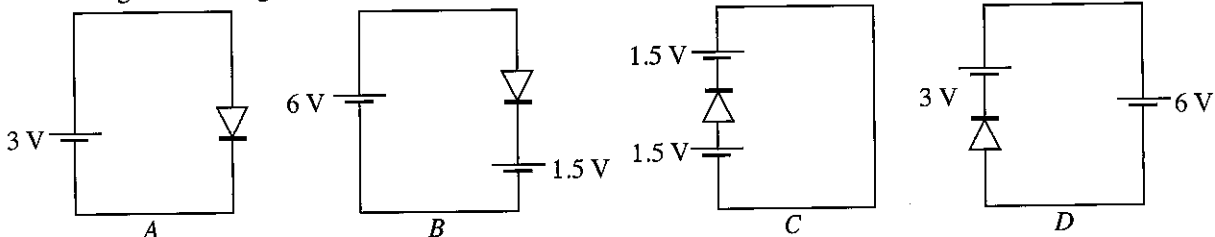
- * Answer all the questions.
- * Write your **Index Number** in the space provided in the answer sheet.
- * Use of calculators is not allowed.
- * Instructions are given on the back of the answer sheet. Follow those carefully.
- * In each of the questions 1 to 50, pick one of the alternatives from (1),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

1. Symbols of three logic gates are give below.



Select the answer which gives the correct matching of logic gates.

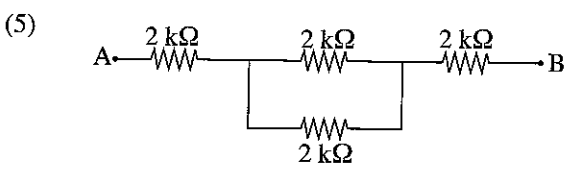
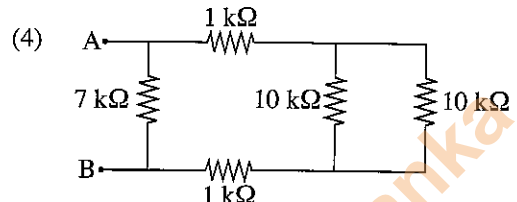
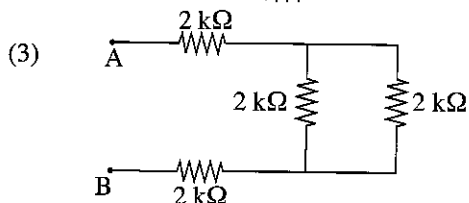
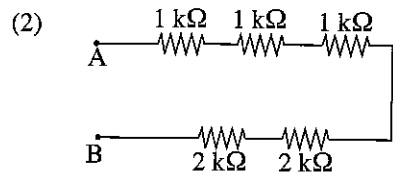
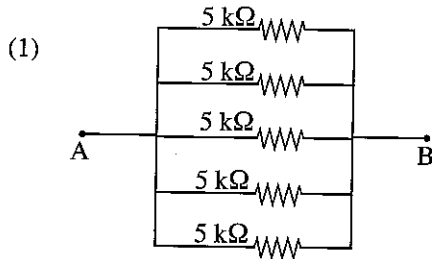
- (1) A-AND, B-NOT, C-OR. (2) A-NOT, B-AND, C-OR.
 (3) A-NOT, B-OR, C-AND. (4) A-OR, B-AND, C-NOT.
 (5) A-OR, B-NOT, C-AND.
2. A 75W incandescent bulb is installed in a house wiring circuit. It is switched ON, 5 hours a day. What is the daily energy saving if this bulb is replaced by a 10W LED Lamp?
 (1) 375Wh (2) 325Wh (3) 50Wh (4) 3.75kWh (5) 5 kWh
3. Consider the following statements.
 A - Cost of treatment of the worker
 B - Cost of lost time of the worker and co-workers in the production line
 C - Salary paid during the recovery period
 D - Compensation to be paid for any disability arising from the accident
 Of the above, statements that mention the cost associated with an industrial accident are
 (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.
4. Which of the following statements describe chemicals used at home?
 A - NaOH is used in toothpaste to whiten teeth.
 B - NaOCl is a common bleaching agent used in toilet cleaning fluids.
 C - NaCl is used when preparing food.
 D - Methanol is used as a disinfectant.
 (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.
5. Following circuit diagrams show four circuits with silicon diodes.



Circuits with forward biased diode are

- (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.

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

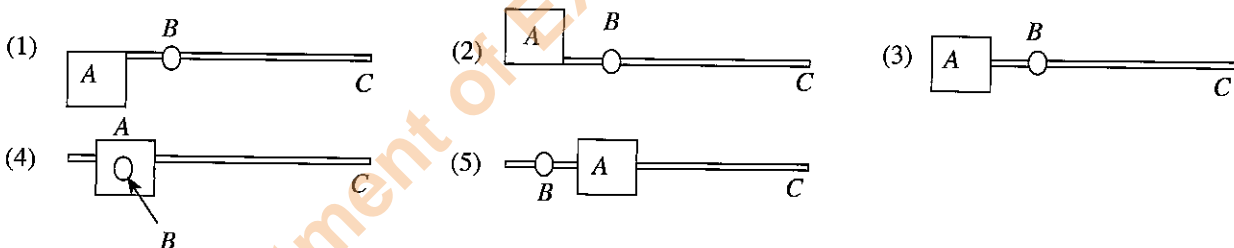


7. A person who has a fruit stall also serves as a property broker who negotiates sales, leases and rentals. Which of the following actions demonstrate his entrepreneurship traits?

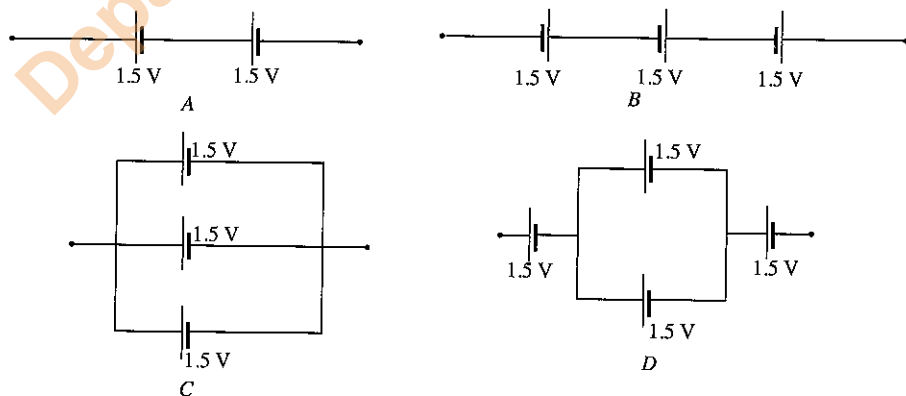
- A - Uses his mobile phone to network with potential clients and fellow property brokers.
- B - Employs a trainee-assistant to help with the sale of fruits.
- C - Maintains a database of information relevant to recent sales, leases and rentals.
- D - Displays a noticeboard with the property details and contact details of clients.

- (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. Which of the following configurations is used by a designer to reduce motor torque of a motorized gate? Side view of the gate is shown in configurations. (A - Counterweight, B - Pivot point, C - Gate).

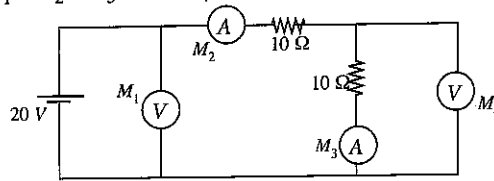


9. Consider following battery arrangements prepared by a student. What are the minimum voltage (V_{min}) and maximum voltage (V_{max}) values obtained by the student?

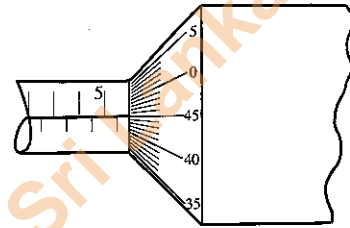


- (1) $V_{min} = 0.5V, V_{max} = 3.75V$ (2) $V_{min} = 1.5V, V_{max} = 4.5V$
 (3) $V_{min} = 3.0V, V_{max} = 3.75V$ (4) $V_{min} = 0.5V, V_{max} = 3.0V$
 (5) $V_{min} = 3.0V, V_{max} = 4.5V$

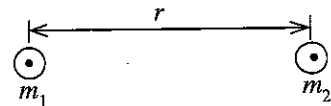
10. Two ideal voltmeters and two ideal ameters are connected in a circuit as shown in Figure. Find the answer with correct reading of M_1 , M_2 , M_3 and M_4 in same order.



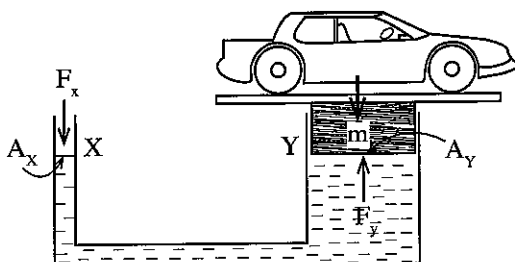
- (1) 20V, 1A, 1A, 10V. (2) 20V, 2A, 2A, 20V. (3) 20V, 1A, 2A, 10V.
 (4) 20V, 1A, 1A, 20V. (5) 10V, 1A, 1A, 10V.
11. A small fire breaks out in electrical equipment in a factory. Which is the best type of fire extinguisher that can be used to minimise damage to the equipment?
 (1) Foam (2) Water (3) Carbon Dioxide
 (4) Powder (5) Wet chemical
12. Figure shows a Micrometer screw gauge. When the circular scale rotates a turn, it moves 0.5mm along the linear scale. The linear scale is in mm. Reading of the Micrometer is
 (1) 5.45 mm. (2) 5.82 mm. (3) 6.40 mm.
 (4) 5.95 mm. (5) 6.95 mm.
13. Select the component which is **not** used in house wiring circuits.
 (1) Residential current circuit breaker (RCCB). (2) Miniature current circuit breaker (MCCB).
 (3) Earth Electrode. (4) Socket outlet.
 (5) Oscilloscope.
14. If a 1kW electric iron is connected to a domestic electricity supply in Sri Lanka, the supply AC voltage, supply frequency and approximate energy consumption respectively for one hour usage are
 (1) 400V, 60Hz, 1kWh. (2) 230V, 50Hz, 1kWh. (3) 230V, 60Hz, 50kWh.
 (4) 50V, 230Hz, 1kWh. (5) 50V, 50Hz, 1kWh.
15. Which of the following devices is **not** suitable for storing your personnel data?
 (1) Compact Disk (CD) (2) Flash drive (3) Floppy disk
 (4) ROM (5) Hard drive
16. What is the basic requirement of a fuse in an electrical circuit?
 (1) To ensure that the current is maintained at correct temperature.
 (2) To protect the circuit against excessive current flow.
 (3) To allow any current flow into the circuit continuously.
 (4) To ensure continued current flow in the event of short circuit.
 (5) To control the temperature of the circuits.



17. The gravitational force, F , between two objects with masses m_1 and m_2 are expressed as $F = G \frac{m_1 m_2}{r^2}$, r is the centre to centre distance between two objects, and G is the gravitational constant. The SI units of G are
 (1) Pa s (2) $\text{m kg}^{-1}\text{s}$
 (3) m^2s^{-1} (4) $\text{m}^3\text{s}^{-2}\text{kg}^{-1}$
 (5) Nm^{-2}s



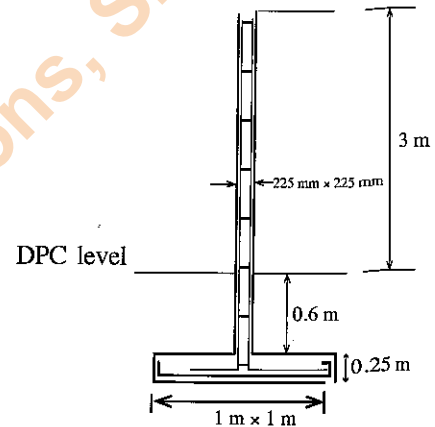
- Following figure shows hydraulic lift used in a vehicle service station. Use the figure to answer questions 18 and 19.



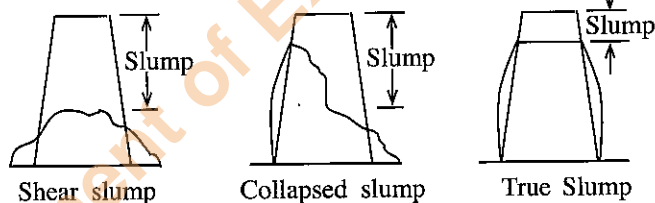
A_x = cross sectional area of X
 A_y = cross sectional area of Y
 P_x = Pressure at X
 P_y = Pressure at Y

18. Which of the following statements is true if $A_x < A_y$?
 (1) $P_x < P_y$ (2) $P_x > P_y$ (3) $P_x = P_y$ (4) $P_x + P_y = 0$ (5) $P_x A_x = P_y A_y$

32. Which one of the following attributes are **not** regulated by building laws in Sri Lanka?
 (1) Clear distance from electrical lines supplying electricity to households.
 (2) Dimensions of internal walls and opening.
 (3) Light and ventilation opening requirements of the building.
 (4) Rear space between the building and its boundary.
 (5) The light angle of the building.
33. Which one of the following persons are empowered by the Urban Development Authority to approve the structural drawing of a five storey office building?
 (1) Chartered Architect. (2) Chartered Engineer. (3) Grade M1 contractor.
 (4) Chartered Quantity Surveyor. (5) The Project Manger.
34. Which of the following statements are true regarding taking-off of quantities for a three-storeyed building?
 A - Plastering work is measured as an area.
 B - Concrete work is measured as a volume.
 C - Excavated volumes of foundations are considered.
 D - Half-brick walls are measured as a length.
 (1) A and B only. (2) A and C only. (3) B and C only.
 (4) A, B and C only. (5) None of the above.
35. Figure shows an isolated pad foundation. Concrete volume of the foundation is
 (1) 0.43 m^3 . (2) 0.25 m^3 .
 (3) 0.52 m^3 . (4) 0.38 m^3 .
 (5) 0.28 m^3 .
36. Which of the following statements are true with regard to separation of solid waste at source?
 A - Collected organic waste can be directly used for composting.
 B - There will be less odour during waste transportation, handling and processing.
 C - The volume of waste generated is reduced.
 D - Wet organic waste shall be further processed before its use.
 (1) A and C only. (2) B and D only. (3) A, B and C only.
 (4) A, B and D only. (5) A, B, C and D all.
37. A catchment area of 2.5 km^2 received a rainfall of 125 mm within 4 hours during a storm event. If the soil infiltration rate is 5 mm/hour, the amount of surface water runoff is estimated at:
 (1) 312500 m^2 . (2) 312499 m^2 . (3) 262500 m^2 . (4) 262400 m^2 . (5) 262450 m^2 .
38. Which of the following attributes are linked to soil erosion?
 A - Distribution of rainfall and land form.
 B - Ground slope.
 C - Deforestation.
 D - Intensity and amount rainfall.
 (1) B and C only. (2) A and D only. (3) A, B and C only.
 (4) B, C and D only. (5) A, B, C and D all.
39. Which of the following statements are true regarding septic tanks and soakage pits?
 A - Both are used as discharge outlets of a drainage system.
 B - Both are constructed below ground level.
 C - Septic tanks are used to digest sewage.
 D - In soakage pits effluent is allowed to seep into the surrounding soil.
 (1) A and B only. (2) B and D only. (3) A, B and C only.
 (4) B, C and D only. (5) A, B, C and D all.



40. Following are some statements regarding domestic sewer and drainage systems in Sri Lanka.
- A - Waste water and sewage shall be discharged to the ground separately.
 - B - Sewer lines are located away from water supply lines.
 - C - A septic tank needs to be constructed at least 18 m away from a well or other drinking water source.
 - D - Water seal in a commode water trap prevents smelly gases escaping into toilets.
- Which statements are true?
- (1) A and B only. (2) B and D only. (3) A, B and C only.
 (4) A, B and D only. (5) A, B, C and D all.
41. A house owner complains about a considerable reduction in water flow speed in his domestic water supply. Which of the following reasons can be the cause?
- A - Leakages in the water supply system.
 - B - Pressure reduction in the water supply system.
 - C - A blockage in the water supply system.
 - D - A problem with the water pump which pumps water from the well to the overhead tank.
- (1) A and B only. (2) B and D only. (3) A, B and C only.
 (4) A, B and D only. (5) A, B, C and D all.
42. Consider the following statements.
- A - Half-brick walls are used as non-load bearing partition walls.
 - B - Half-brick walls can be strengthened using intermediate brick piers.
 - C - Half-brick walls can be strengthened using buttresses.
 - D - Stretcher Bond is a common bond type used in half-brick walls.
- Which of the above statements are true regarding half-brick walls?
- (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.
43. The least bearing capacity of a soil is observed in
- (1) Compacted Quarry dust. (2) Compacted weathered rock.
 (3) Compacted Well-graded sand. (4) Compacted organic clay.
 (5) Compacted Well-graded gravel.
44. Figure shows the different slump types you may observe during the slump test.



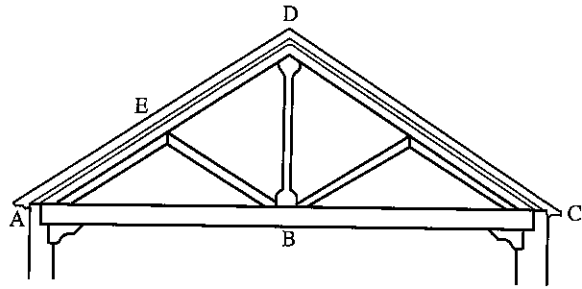
Consider the following statements about slumps.

- A - Shear slump indicates that the concrete mix lacks cohesion.
- B - Collapse slump indicates that the water/cement ratio is too high.
- C - A true slump of 50-90 mm is acceptable for concreting with vibration.
- D - A true slump of more than 100 mm is not used for any concrete work.

The true statements regarding slump types are

- (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.
45. Consider the following statements with regard to curing of concretes.
- A - During curing, the required moisture content and temperature is maintained.
 - B - Wet-covering of newly concreted surface is a method used during curing.
 - C - Proper curing ensures the desired concrete strength.
 - D - Curing should be done during 3-7 days, after placing of concrete.
- The true statements are
- (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.

46. Figure shows a simple timber structure used to support a roof with a short-span. Consider the following statements regarding them.



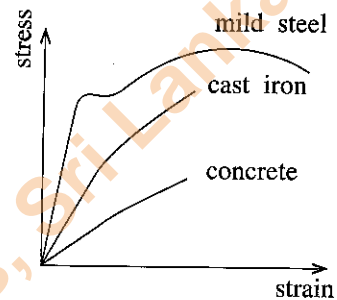
- A - Member ABC carries a tensile stress.
 B - Member EB carries a tensile stress.
 C - Member DB carries a compressive stress.
 D - This is not a stable structure.

The true statements out of the above are

- (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, C, B and D all.

47. Figure compares the stress-strain behaviour of three important engineering material types. Consider the following statements related to them.

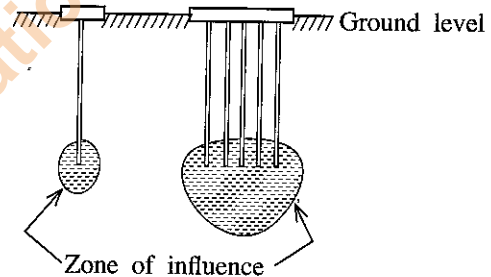
- A - Young's Modulus of Cast Iron is less than that of Mild Steel.
 B - Concrete and Cast Iron shows ductile behaviour.
 C - The variation observed for Mild Steel is based on a tensile test.
 D - The variation observed for Concrete is based on a compression test.



The true statements out of the above are

- (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.

48. The shaded area in the figure shows the influence zones for a single pile and for a pile group. Consider the following statements:



- A - Piles transmit structural loads safely to a bearing stratum, located at a greater depth.
 B - Zone of influence of a pile group extends to a greater depth than the zone of influence for a single pile.
 C - Sri Lanka prefers reinforced concrete piles over other types.
 D - Piles can extend below the groundwater table level.

Out of the above, the true statements are

- (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.

49. Consider the following statements that describe a Damp-Proof-Course (DPC).

- A - A DPC prevents upward migration of moisture between the plinth and brickwork.
 B - A DPC is placed 150 mm above finished ground level; continuous along the whole length and breadth of brickwork.
 C - In a damp and humid atmosphere, the DPC layer can be made of a rich cement concrete mix.
 D - A DPC layer helps prevent termite movement through brickwork.

Out of the above, the statements that describe a Damp-Proof Course are

- (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.

50. Which one of the following statements on road signs is **incorrect**?

- (1) No parking double line allows unloading of goods within the marked stretch.
 (2) 60 km/h sign gives the speed limit for heavy vehicles in non-built-up areas.
 (3) 50 km/h sign gives the speed limit for within built-up areas except for 3 wheelers and land vehicles.
 (4) Yellow traffic-light sign requires you to prepare to stop your vehicle at the traffic light post.
 (5) Longitudinal double continuous centre lines require you not to cross or overtake within the marked stretch.

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 கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர) பரீட்சை, 2017 ஆகஸ்ட்
 General Certificate of Education (Adv. Level) Examination, August 2017

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 குடிசார்த் தொழினுட்பவியல் II
 Civil Technology II

14 E II

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 மூன்று மணித்தியாலம்
 Three hours

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 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	

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PART A – Structured Essay
 Answer all four questions on this paper itself.
 (Each question carries 10 marks)

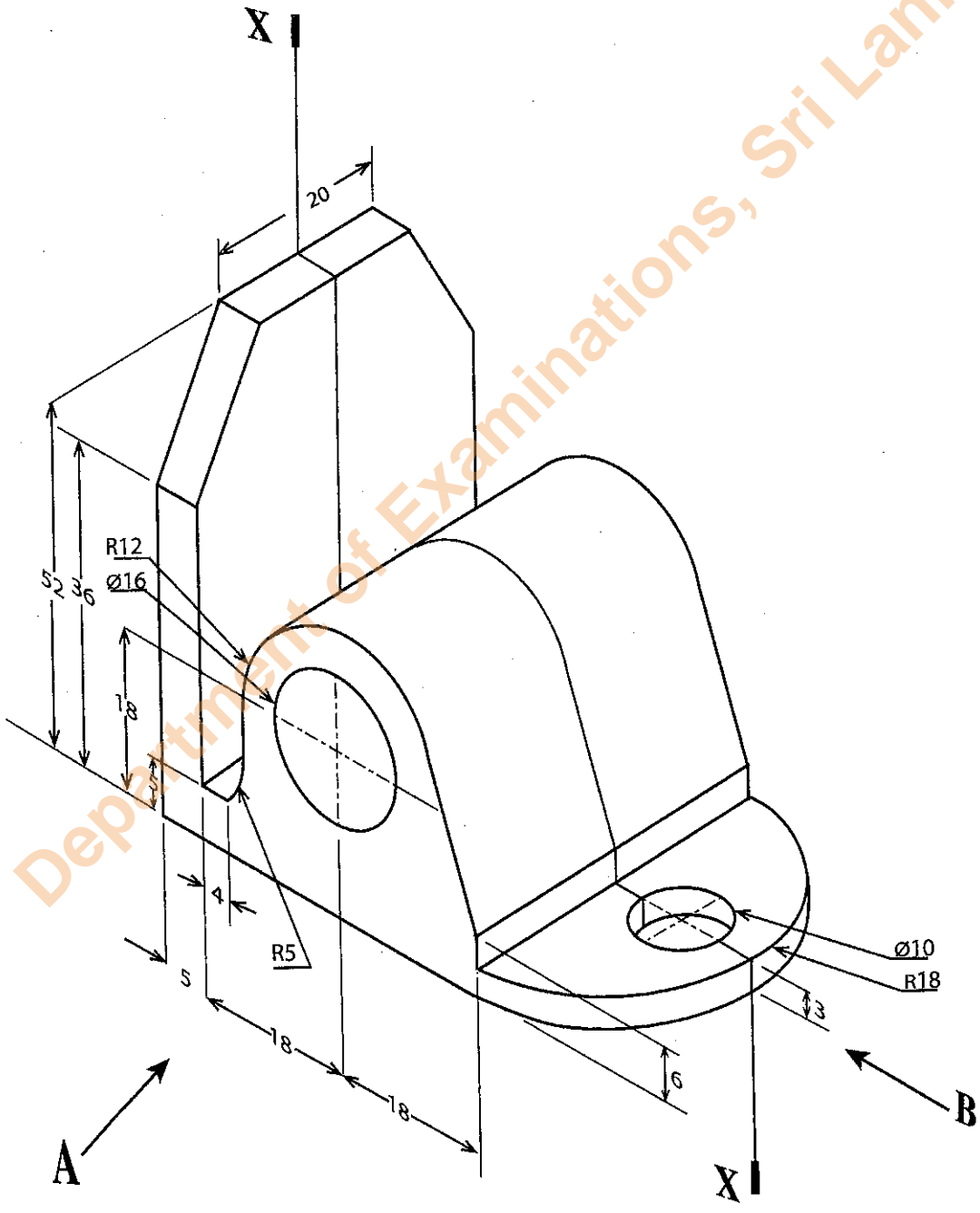
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Part A

1. Following figure shows an isometric view of a machine component. It is symmetric along the vertical plane passing through X-X. Assuming any missing dimensions, draw the following views to a suitable scale using first angle projection principle.

Show all relevant dimensions in the views. Use the graph sheets given on page 3 and 4 to answer the questions. (All dimensions are in mm).

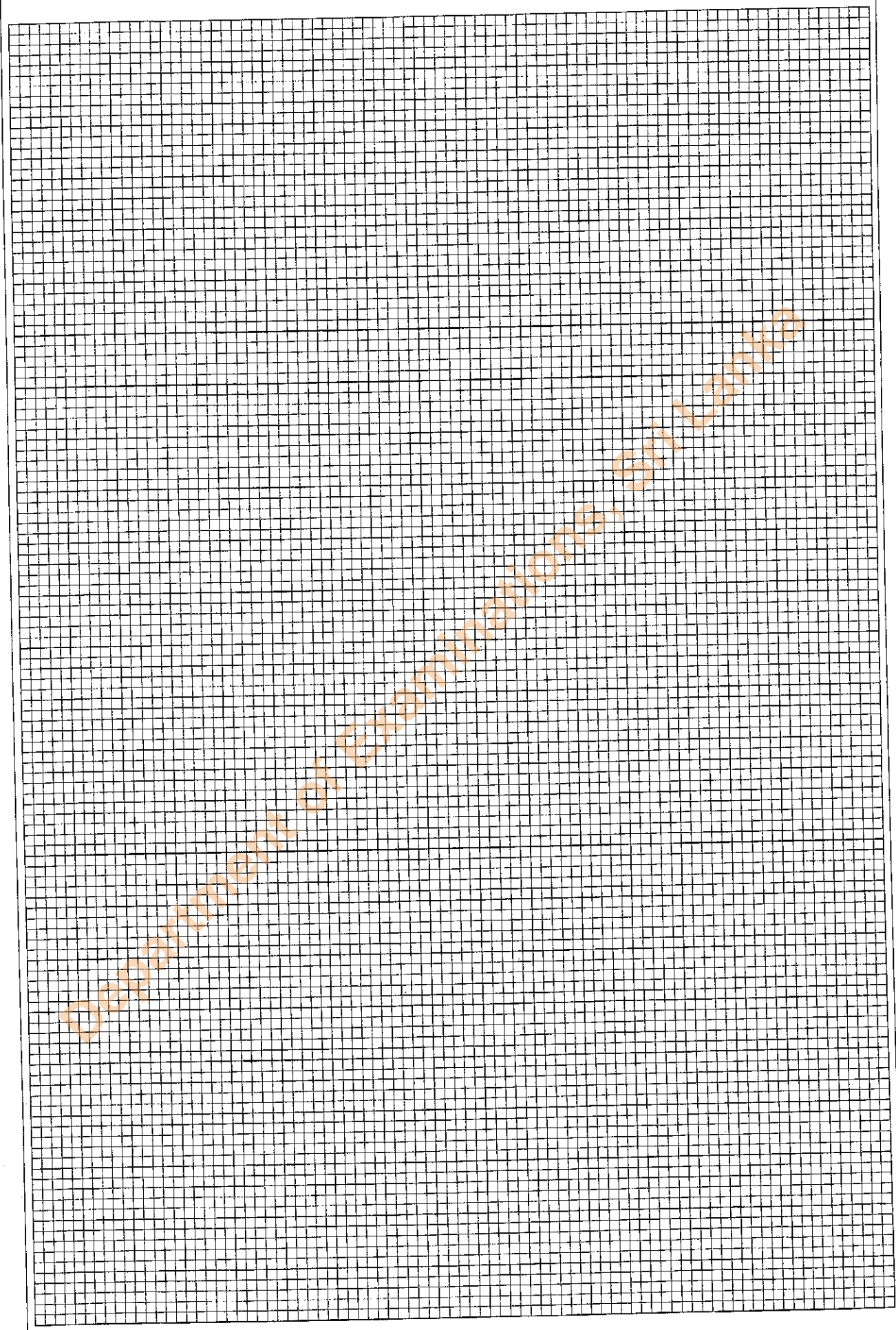
- (i) Front elevation seen through direction A.
- (ii) End elevation seen through direction B.
- (iii) Plan view.



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2. Online data storages are commonly used in IT industry and for personal use. Furthermore, online version of documents and presentation slides are frequently used. These online versions facilitate collaborative editing of documents by multiple users from different computers. Consider 'ABC Drive', a service provider available in online through the Internet who provide following facilities from an online storage facility.

- (i) Storage of files upto 10 GB for an login created based on an official email.
- (ii) Sharing folders, data files and documents among many users.
- (iii) Preparing documents and presentation slides online.
- (iv) Editing online documents and presentation slides by many parties.

Assume that you are appointed as the IT technical officer responsible in formulating a plan to modernise the IT facilities of a company. Answer following questions by considering above mentioned details of online data storages.

(a) The company has a discussion room and a computer facility for design work. Assume a design team of five employees are preparing a document in a meeting which is scheduled in the discussion room. Furthermore, they are planning to use online document facilities.

(i) State hardware required for each member to perform the above mentioned task.

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(ii) State one facility required for the hardware mentioned in question (i).

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(b) Assume that one member of the team had a medical issue requiring him to rest at home for a period of two weeks. However he has decided to support the design team while being at home. He does not have any facility provided by the company. However, following hardware and relevant software are available in his personal capacities.

- a system unit with windows operating system.
- two keyboards and two mouses
- two monitors
- a laser printer
- a microphone and a speaker.
- a dongle with broadband internet connection

(i) State **four** hardware components required for preparing fully functional computer capable of dealing with online documents by using only the components available at home.

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(ii) Assume that Microsoft Office package is **not** installed in the computer mentioned in part (i). State an alternate method for preparing the document.

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(c) The team member mentioned in part (b) wishes to join the team in the discussion room of company through video conferencing facilities.

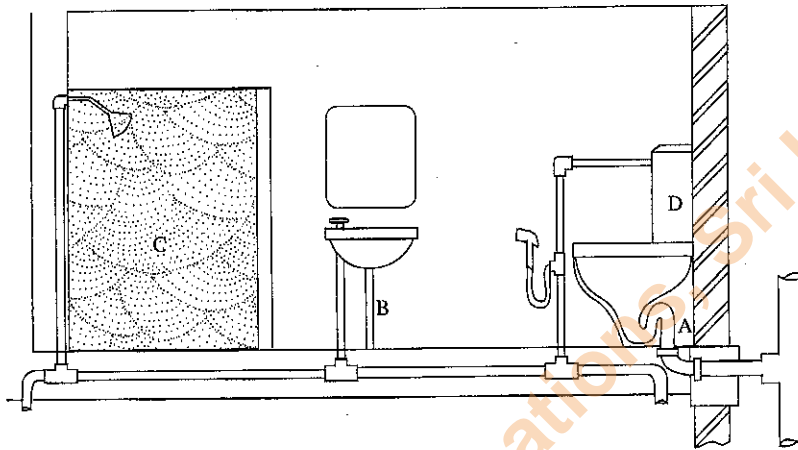
(i) State **two** other hardware components required for his purpose.

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(ii) State the relevant software package required to perform this task.

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3. Figure shows the pipe layout of the water supply system for a bathroom consisting of a sink, a commode with a cistern, cubicle and a shower.



(a) State the specifications for the pipe layout to be used in the water supply system.

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(b) Specify the type of fittings to be used. Identify their respective locations on figure.

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(c) Sketch the waste-water drainage path from the bathroom to the soakage pit, identifying all structural components in the system.

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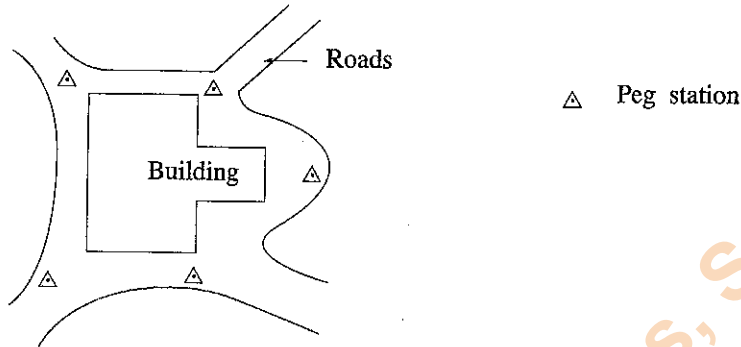
(d) Discuss how you would connect the commode to the main sewer pipe leading to the septic tank, while explaining how you would make the connection "water-tight".

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4. A traverse survey is to be done to locate a building as shown in the figure.



(a) List surveying equipments and accessories that are needed to carry out the said traverse survey.

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(b) Draw a sketch of an optical theodolite and name its important components.

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(c) Briefly explain how you would carry out the above survey.

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සිවිල් තාක්ෂණවේදය II
 குடிசார்த் தொழினுட்பவியல் II
 Civil Technology II

14 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

1. An urban house consists of electrical items mentioned in table 1. Power ratings and average usage per month are given in columns 3 and 4, respectively.

Item	No of items	Power rating per item (W)	Usage per month (h) per item
Bulbs (CFL)	06	15	150
Fans	03	60	90
LED TV	01	55	150
Rice Cooker	01	300	10
Washing Machine	01	750	08
Refrigerator	01	600	70

Table 1

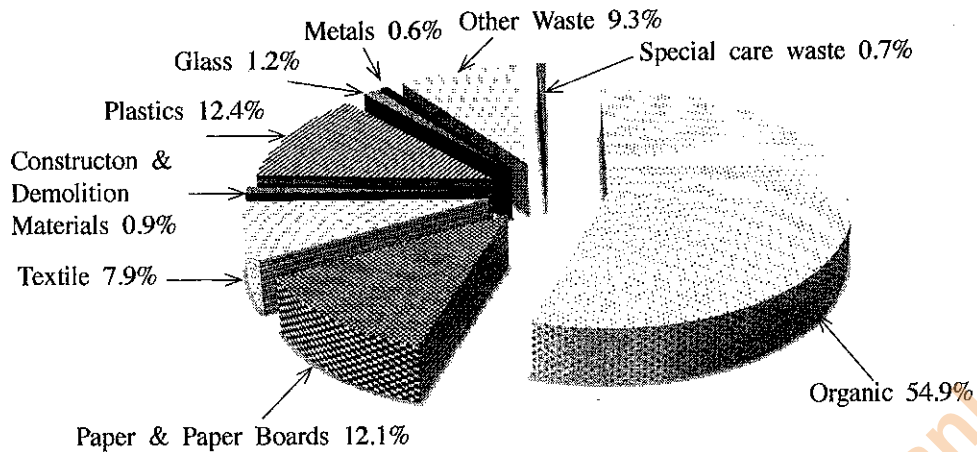
Table 2 summarizes the electricity tariff for electric consumption of domestic usage given by the electricity board.

Consumption (kWh)	Energy charge Rs.
0-30	2
31-60	5
61-90	10
91-120	25
121-180	32
more than 180	45

Table 2

- (a) Making relevant assumptions, if any, to calculate the total electricity consumption and the electricity cost per month.
- (b) Owner of the house is planning to purchase a new electric vehicle that has following specifications.
 Range: 10 km/kWh
 Battery Capacity: 10 kWh
- (i) Calculate the additional electricity consumption and electricity cost per month resulting from this purchase. Assume that the monthly average travelling distance of the vehicle is 1600 km.
- (ii) For the same price, it is possible to buy a petrol engine vehicle which has the average mileage of 14 km/l. Using the results from (i), briefly explain the criteria the owner should consider in purchasing an electric car or a petrol car when financial benefits are taken into consideration.

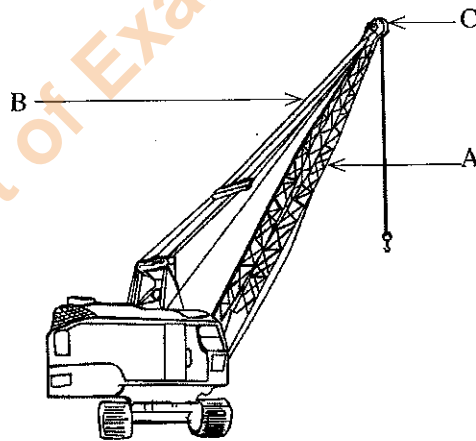
2. Figure shows average composition of Municipal Solid Waste (MSW) of the Colombo Municipal Council (CMC) area. The Organic Waste has a moisture content range of 60-75% with low calorific value of 6000-9000 kJ/kg.



(Source : Sri Lanka Sustainable Energy Authority)

- List the waste types that can be recovered for later processing and can be used to generate energy.
- The CMC requires households to separate organic waste from paper, plastics and glass. Discuss **two** benefits to CMC for mandating waste separation at source.
- Many countries consider Municipal Waste as an 'economic good'. Explain why it can be considered as an economic good.
- Waste to energy conversion requires burning of trash to generate steam, which in turn is used to drive a turbine to generate electricity. Explain how the solid waste can be processed in order to enhance efficiency of energy conversion.

3. Figure shows a track mounted crawler crane.



- Discuss the specific purposes of components A, B, and C as shown in Figure.
- Discuss the type of forces transferred via components A and B, when the crane has no load, and when it lifts a load.
- Explain how equilibrium is maintained while in operation without it tipping over.
- Sketch the configuration you would propose to use when the object is too heavy to be lifted using a single cable.
- Sketch the mechanism that can be used to rotate the crane about its vertical axis of rotation.
- Describe **two** instances where a track mounted crawler crane is preferred over other types of mobile cranes.

Part C

4. Figure shows a schematic diagram of a Yale mortice sash lock, which is suitable for a bedroom door. Suppose that you have been requested to write a method statement to be followed by the contractor when fixing door locks to all bedroom doors.

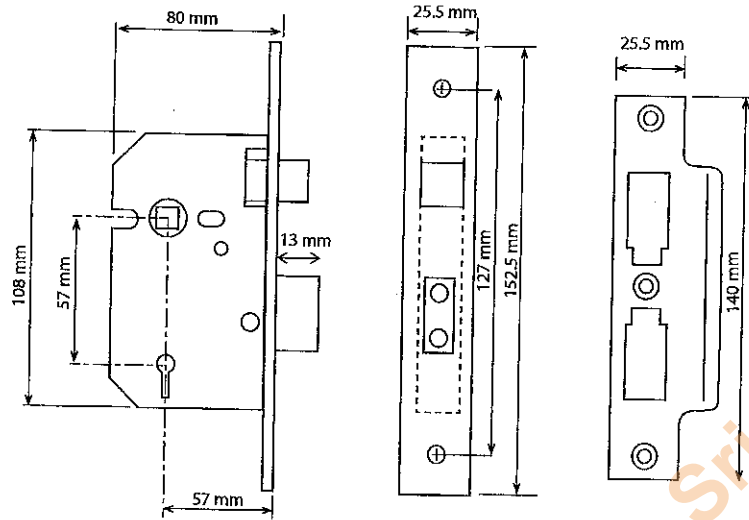
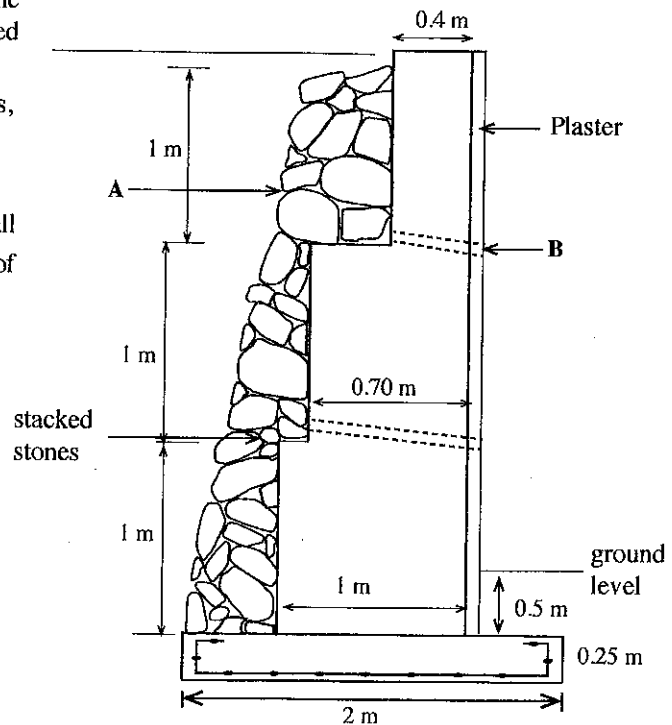


Figure <https://www.lockmonster.co.uk/item/yale-mortice-sashlock-a-great-internal-door-lock-pm320>

- Provide a sketch of the door sash and the frame indicating important dimensions for the said purpose. Show on the same sketch the location of the locking arrangement.
- Using sketches, show how the lock rail and the door stile of the door sash are prepared to accommodate the door lock. (The candidate is expected to state the dimensions and the tools to be used.)
- Using sketches, show how the door frame is prepared to accommodate the door lock. (The candidate is expected to state the dimensions and the tools to be used.)

5. A 10 m long random rubble masonry retaining wall has been proposed as an earth support. Figure shows the cross-sectional view and plan view of the proposed wall.

- Prepare taking-off sheets for following items,
 - Excavation for the strip foundation
 - Concrete work of the foundation
 - Random rubble masonry work of the wall
 - Plastering work of the external surface of the wall
- State the specifications for items A and B.



6. A municipal council of an urban environment, situated in the wet zone of Sri Lanka has been struggling with solid waste management and disposal issues, over a long period of time. It collects household waste and non-hazardous industrial waste.

Currently, a daily load of 100 metric tonnes of unsorted solid waste is collected and disposed in an open dump, located within the council area. Water table in the area is 0.5-1m below ground level, and the adjoining waterway carries polluted water to the nearby river.

Recently a team with professionals has been appointed to conduct a feasibility study to address solid waste management and disposal related issues.

- (a) Discuss the possible **negative** effects on the water resource in the area, due to the current unplanned solid waste disposal method.
- (b) The team is planning on introducing methods which can be adopted at household level towards proper waste management. Discuss **three** methods which can be introduced and successfully implemented at the household level.
- (c) Currently the team is in search for a suitable landfill site in the neighbouring province. Discuss possible technical, social and economic issues that may need to be addressed.
- (d) Discuss how the said Municipal Council could incentivize households to self-manage their solid waste, as a long-term strategy.

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