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

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2018 අගෝස්තු
கல்விப் பொதுத் தராதர பத்திர (உயர் தர)ப் பரீட்சை, 2018 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2018

14.08.2018 / 13 00 - 15 00

සිවිල් තාක්ෂණවේදය I குடிசார்த் தொழினுட்பவியல் I Civil Technology I	14 E I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

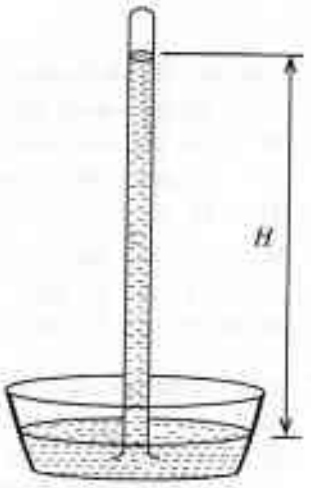
- *Answer **all** the questions.*
- *Write your **Index Number** in the space provided in the answer sheet.*
- *Use of calculators is not allowed.*
- *Instructions are given on the back of the answer sheet. Follow those carefully.*
- *In each of the questions **1** to **50**, pick one of the alternatives 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. Young's modulus of steel is 1.9×10^{10} N/m^2. 1N=10^5 cm g/s^2. How is this value expressed in CGS (Centimetre, Gram, Second) units?

(1) 1.9×10^{9} (2) 1.9×10^{10} (3) 1.9×10^{11} (4) 1.9×10^{12} (5) 1.9×10^{13}

2. Figure shows a mercury column in a simple barometer.

A - The height *H* depends on the atmospheric pressure.
B - *H* is approximately equal to 760 mm.
C - The presence of water above the mercury surface in the column increases the height *H*.
D - The height *H* is an indicator of the maximum suction head when pumping water from a well.



Figure

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.

3. Consider the following statements that describe certain chemicals.

A - A standard motor car battery has Sulfuric Acid and Lead.
B - Soap molecule can attract water at one end, and oil at the other.
C - Toilet bowl cleaning liquid has Sodium Hypochlorite.
D - Salt helps to relax cramped muscles.

Which of the above statements describe a chemical used at home?

(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.

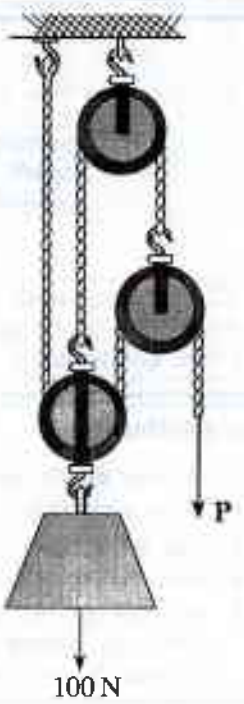
4. Which of the following actions demonstrate entrepreneurship traits of an owner of a family that owns a restaurant?

A - The use of close circuit television cameras to cover the restaurant area
B - Eldest daughter managing the cashier desk
C - Using a separate freezer for ready-to-use fish and meat stocks
D - Assigning two employees daily to clean and disinfect the kitchen area and the rest rooms twice a day

(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.

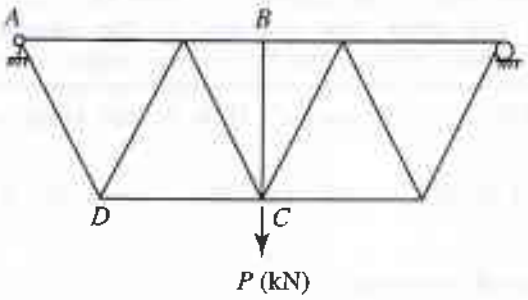
[See page two

5. A pulley arrangement is shown to lift 100 N (approximately equal to 10 kg) as shown in the figure. Each pulley has a weight of 10 N (approximately equal to 1kg). Force **P**, required for the equilibrium of the system is



(1) 20 N.
(2) 22.5 N.
(3) 25 N.
(4) 27.5 N.
(5) 50 N.

6. A steel truss is used to support a load at point *C* as shown in the figure.



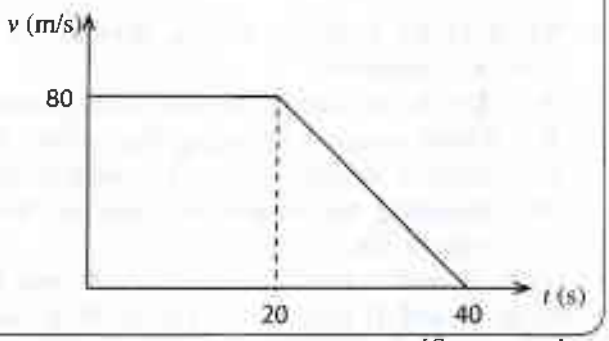
Consider the following statements on the steel truss given in the figure.
A - All top chord members carry compressive forces.
B - All bottom chord members carry tensile forces.
C - Member *BC* is not required to maintain stability.
D - Member *AD* carries a tensile force.

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.

7. Two cylindrical steel specimens, *A* and *B*, with similar length and diameter were subjected to a continuous load until failure. Specimen *A* failed at a load of 1200 kN with an elongation of 2.1 mm. Specimen *B* failed at a load of 1350 kN with an elongation of 1.9 mm.
A - Specimen *A* is more ductile than *B*.
B - Specimen *B* is more ductile than *A*.
C - Specimen *A* has a higher ultimate tensile strength than *B*.
D - Specimen *B* has a higher ultimate tensile strength than *A*.

Which of these statements are true?
(1) A and C only. (2) A and D only. (3) B and C only.
(4) B and D only. (5) None of above.

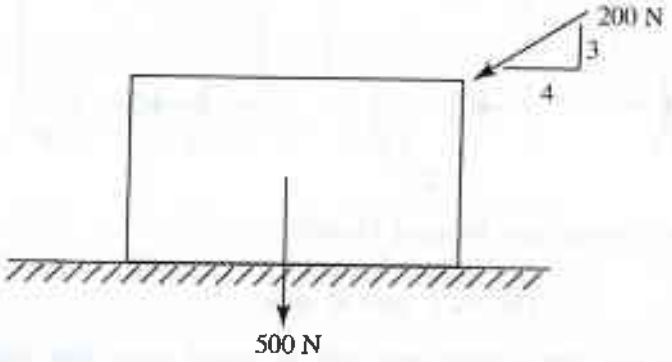
8. A van travels along a straight road from points *A* to *B*, and its velocity versus time graph is shown in the figure. The total distance it travelled is



(1) 1.8 km.
(2) 2.0 km.
(3) 2.4 km.
(4) 2.6 km.
(5) 2.8 km.

[See page three

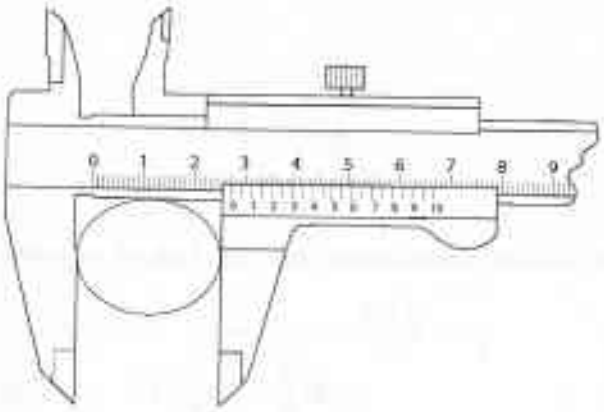
9. A uniform crate has a weight of 500 N (approximately equal to 50 kg) and it is pushed with a force of 200 N as shown in the Figure. Coefficient of static friction between the crate and ground is 0.3.



The friction force at the limiting equilibrium state is

(1) 186 N. (2) 195 N. (3) 200 N. (4) 260 N. (5) 500 N.

- Following figure shows a measurement of a steel rod taken from a vernier calliper. Use the figure to answer questions **10** and **11**.



10. What is the minimum reading of the vernier calliper in mm?

(1) 0.005 (2) 0.01 (3) 0.02 (4) 0.05 (5) 0.1

11. What is the diameter of the steel rod?

(1) 2.75 cm (2) 2.80 cm (3) 2.55 cm (4) 2.59 cm (5) 2.42 cm

12. Which of the following describes the scale in nanotechnology?

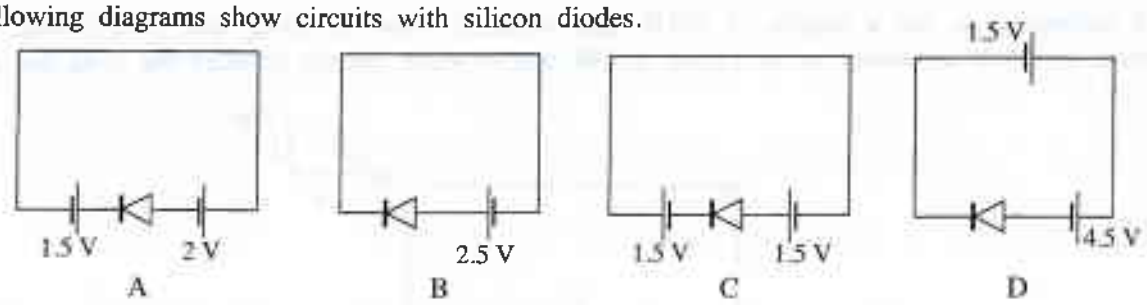
(1) 0 mm – 100 mm
(2) 10^{-9} mm – 9×10^{-6} mm
(3) 10^{-3} mm – 10^{-6} mm
(4) 10^{-6} mm – 9×10^{-6} mm
(5) 10^{-7} mm – 10^{-6} mm

13. Which of the following statement is most appropriate to the nanotechnology?

(1) It is a technology related to static electricity.
(2) It can be named as a green technology.
(3) It is a branch of robotic technology.
(4) Lotus effect can be described using nanotechnology.
(5) It can be named as a new automobile technology.

[See page four

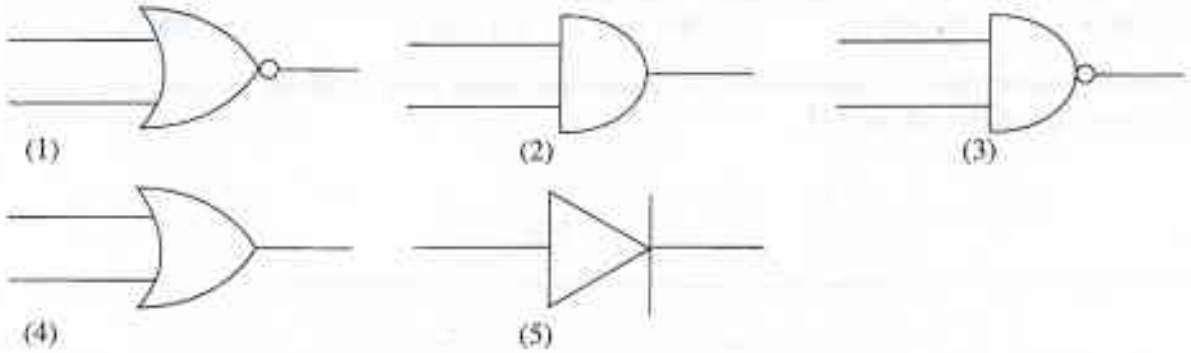
14. Following diagrams show circuits with silicon diodes.



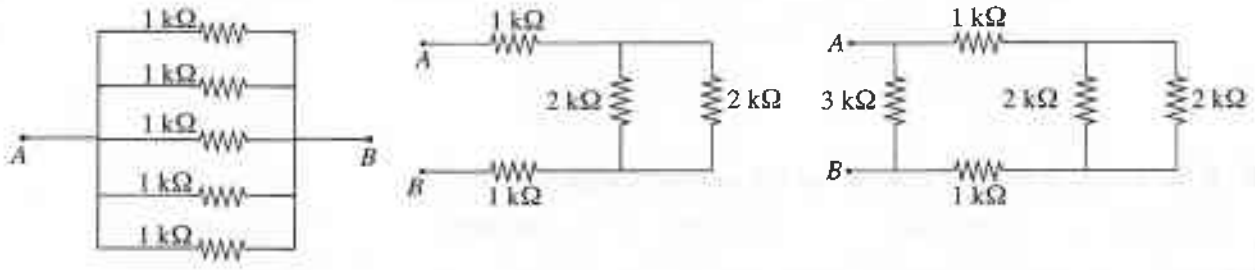
Which of the above circuits are forward biased?

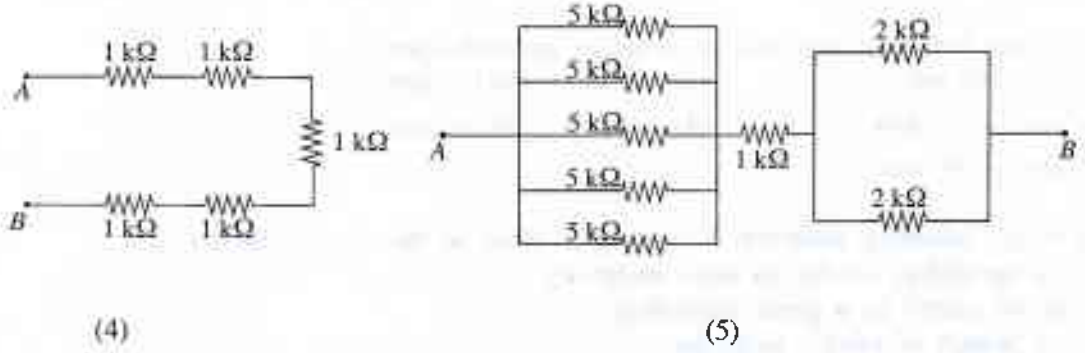
(1) A and B only. (2) B and C only. (3) C and D only.
(4) A and D only. (5) A, C and D only.

15. What is the symbol used for a logic gate with an output logic state equals to 1, when only logic state of all inputs are equal to 0?



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

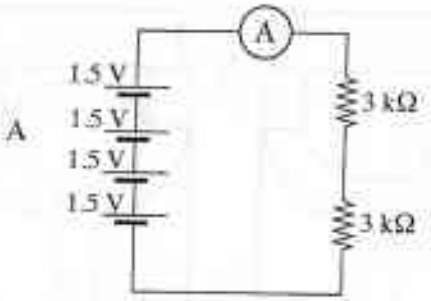




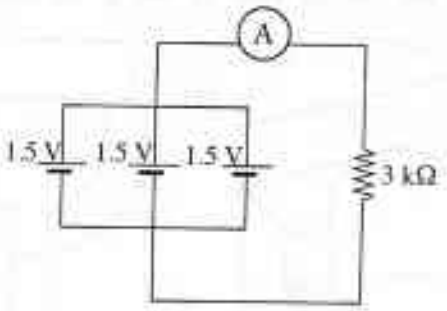
[See page five

17. Consider the following circuit arrangements.

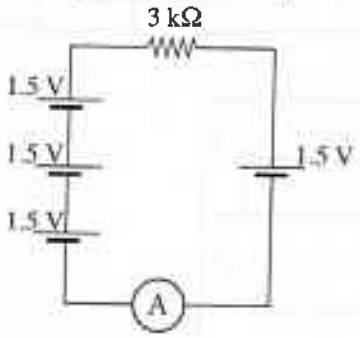
A



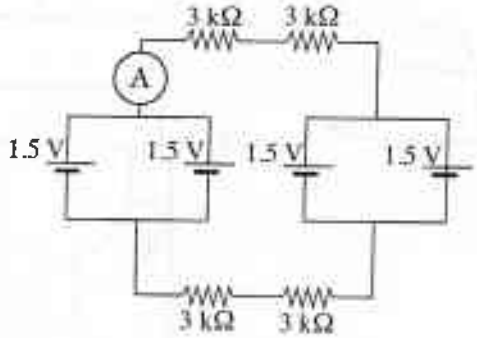
B



C



D



What is the option that gives the ascending order of ammeter readings?

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

18. A 10 W LED lamp is installed in a house wiring circuit. It is switched 2 hours in the morning and for 6 hours at night. What is the daily power consumption of the lamp?

(1) 0.08 kW h (2) 0.1 kW h (3) 0.8 kW h (4) 10 kW h (5) 80 kW h

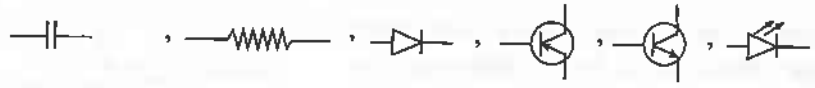
19. Select the answer with the component which is **not** used in house wiring circuit?

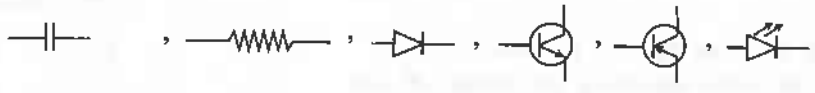
(1) Residual current circuit breaker (RCCB), Miniature current circuit breaker (MCCB), Socket outlet.
(2) Earth electrode, RCCB, MCCB.
(3) Oscilloscope, earth electrode, RCCB.
(4) Electricity meter, earth electrode, RCCB.
(5) Main switch, RCCB, MCCB.

20. Consider the following electronic components.

A - Capacitor B - Resistor
C - Diode D - NPN transistor
E - PNP transistor F - Light Emitting Diode (LED)

Select the option which gives the correct symbols for electronic components given above.

(1) 

(2) 

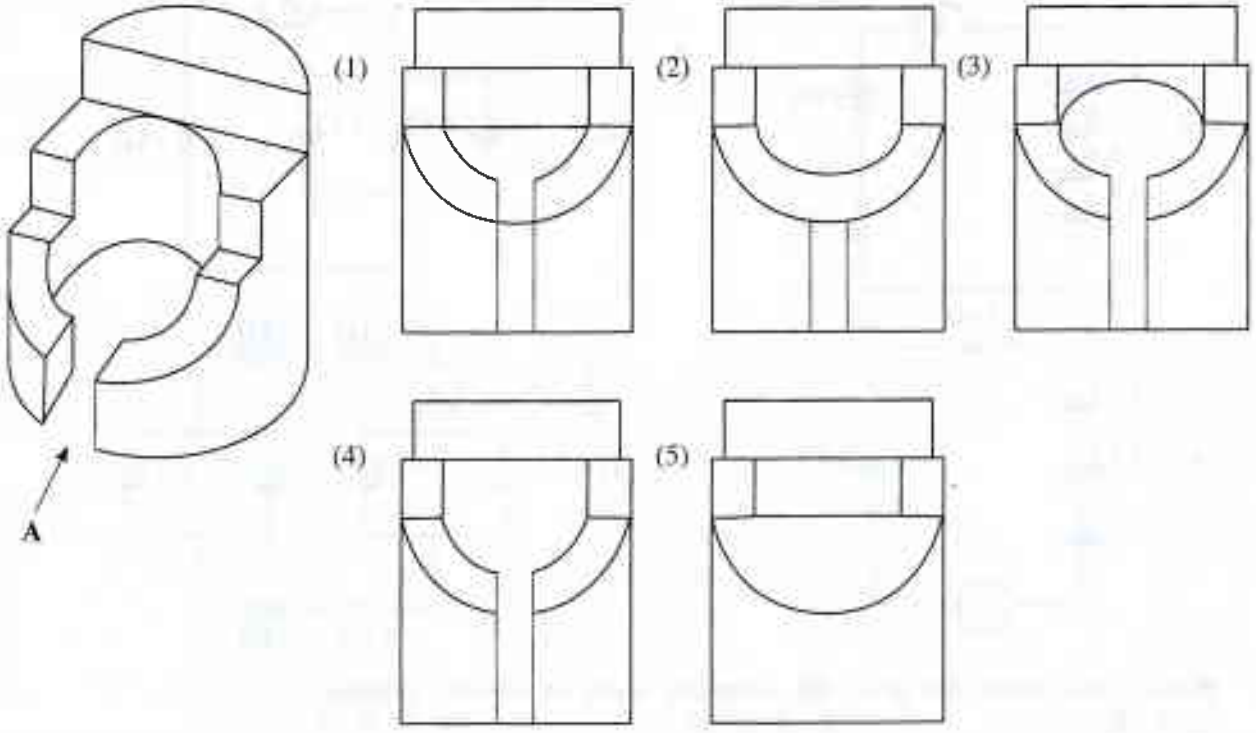
(3) 

(4) 

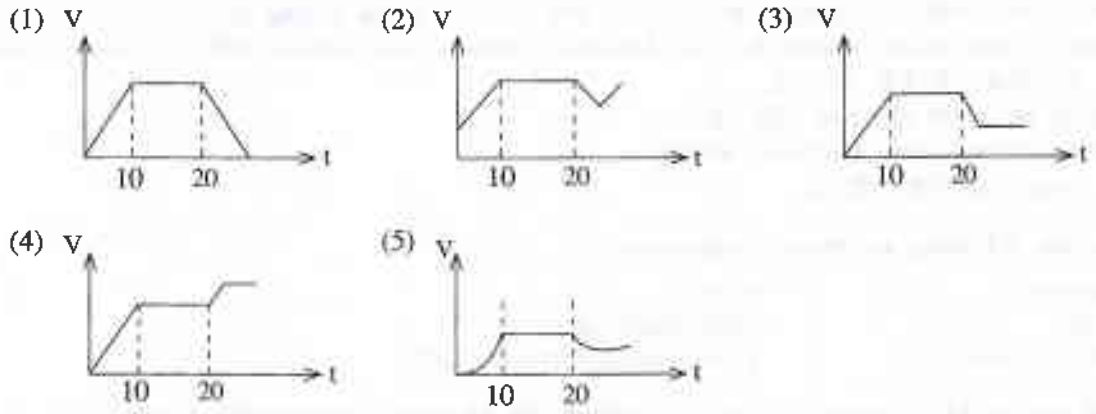
(5) 

[See page six

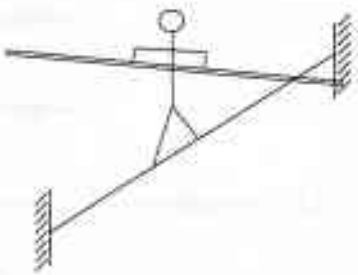
21. Select the correct view of the given Isometric view when looking from direction **A**.



22. A motorcycle accelerates constantly from the rest for 10 seconds and maintains a constant velocity for another 10 seconds. Due to a pedestrian crossing the road, the rider applies sudden brakes to slow down and keeps moving in a lower velocity than before. Which velocity-time graph represents this motion correctly?



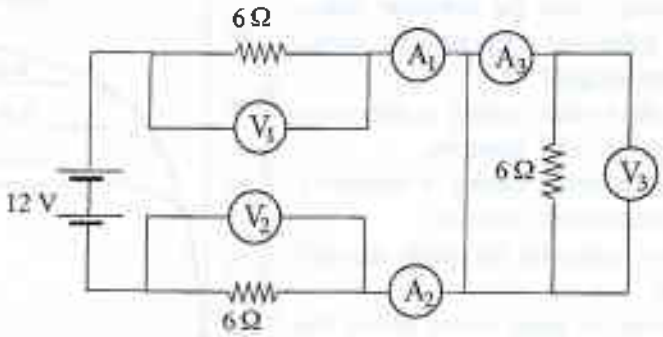
23. As shown in the figure gymnast usually takes a long pole when he walks on a rope at heights. What is the best explanation for this?



(1) To use the pole to touch the floor in case he tilts.
(2) To establish the balance by wide spreading the weight of the person and pole.
(3) To entertain the crowd more as it is difficult to walk with the pole.
(4) To change the moment of inertia to re-establish the balance using the pole in case of out of balance situations.
(5) To increase the reaction force from the rope.

{*See page seven*

● Consider the following circuit and answer questions **24** and **25**.



24. Select the answer with correct ammeter readings of A_1, A_2 and A_3 respectively.
(1) 1A, 1A, 1A (2) 1A, 1A 0A (3) 2A, 2A, 2A
(4) 6A, 6A, 6A (5) 12A, 12A, 0A

25. Select the answer with correct voltmeter readings of V_1, V_2 and V_3 respectively.
(1) 1V, 1V, 0V (2) 6V, 6V, 0V (3) 6V, 6V, 6V
(4) 12V, 6V, 0V (5) 12V, 12V, 12V

26. Which of the following statements are true regarding brick walls?
A - Stretcher bond is used in half-brick walls.
B - Header bond is used in full-brick walls.
C - English bond is stronger than the header or stretcher bonds.
D - A brick size of 225×112.5×75 mm includes a single mortar joint thickness.
(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) All A, B, C and D.

27. Which of the following statements are true, regarding a Random Rubble Masonry plinth wall?
A - The structural load is transmitted via interlocking stones.
B - The structural load is transmitted via the cement mortar joints.
C - The standard size of the wall selected is approximately 150×225 mm.
D - A key stone is placed at every 1 m length and height.
(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) All A, B, C and D.

28. During batching of cement, a 50 kg cement bag fills a gauge box of dimensions 305 mm × 305 mm × 380 mm. When a standard 1:2:4 mix is used, select the respective volumes of fine and coarse aggregate required for a 50 kg cement bag.
(1) 0.02 cubes and 0.04 cubes
(2) 0.025 cubes and 0.05 cubes
(3) 1 cube and 2 cubes
(4) 2 cubes and 4 cubes
(5) 2.5 cubes and 5.0 cubes

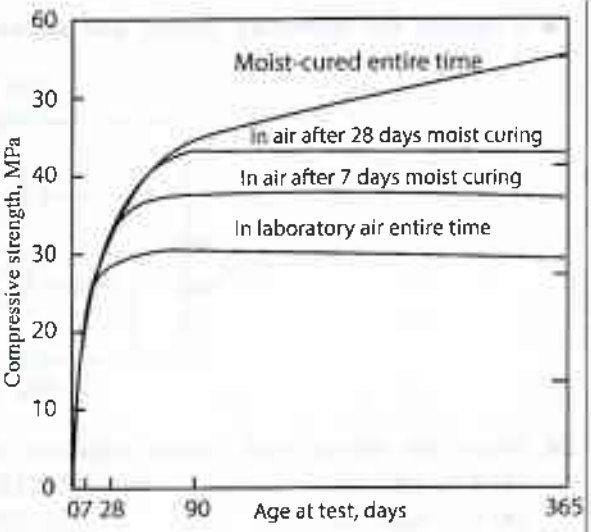
29. The suggested water/cement ratio for a 1:2:4 concrete mix is
(1) 0.2 (2) 0.5 (3) 0.6 (4) 0.7 (5) 1.0

30. Which of the following statements are true regarding the use of enamel paint?
A - Enamel paints give a hard washable glossy finish.
B - Enamel paints are used on timber doors, windows and table tops.
C - Oil based paint dries faster than water based paint.
D - When painting a metal surface, a primer is used as an undercoat.
(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.

[*See page eight*

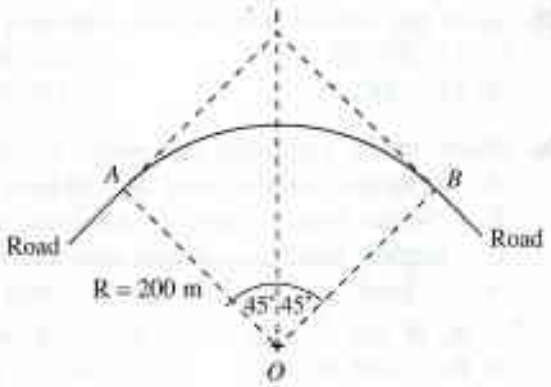
31. Figure shows the variation in Compressive Strength gained with Moist Curing Time for concrete cubes tested. Which of the following conclusions would you make based on this graph?

(1) A minimum of 28 days moist curing is necessary for high strength reinforced concrete.
(2) A minimum of 7 days moist curing is necessary for high strength reinforced concrete.
(3) Moist curing is not essential for high strength reinforced concrete.
(4) Moist curing requires to pond water above the concrete.
(5) Moist curing is not mandatory in a field setting.



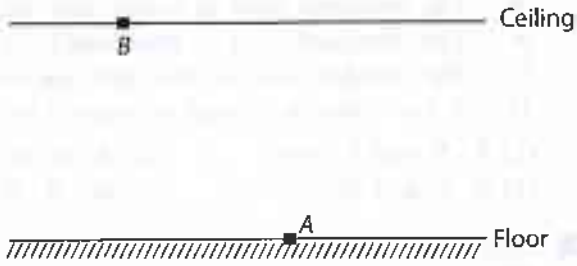
32. A setting out of a circular road circle is shown in figure below. The chainage at the intersection point *I* is determined as 459.25 m. Curve radius R and arc length *AB* are 200.00m and 314.50m respectively. The chainage at *B* is

(1) 973.75 m.
(2) 573.75 m.
(3) 503.75 m.
(4) 373.75 m.
(5) 344.75 m.



33. When setting out the ceiling level of a house, the reduced level of point *A* which is on the floor is 100.000 m and the backsight reading on point *A* is 1.455m. If the foresight reading of point *B* which is on the ceiling is 1.745 m. Then, the reduced level at point *B* is

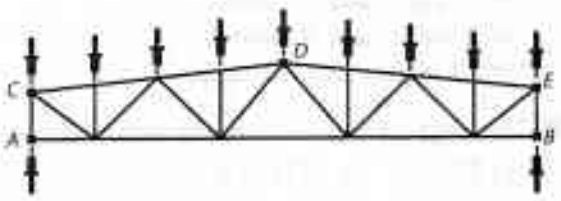
(1) 94.80 m.
(2) 99.71 m.
(3) 100.29 m.
(4) 103.20 m.
(5) 104.20 m.



34. Figure shows a steel truss supporting equal roof point loads.

Consider the following statements on the given figure.

A - The support reactions at supports *A* and *B* are the same.
B - All members of the top chord *CDE* carry a compressive load.
C - All members are expected to transmit axial loads only.
D - The vertical members joining the top and the bottom chords do not carry any force.



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) All A, B, C and D.

|See page nine

35. Which one of the following beam cross sections best represents the reinforcement arrangement at a column support?

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

36. Figure shows a compression force applied on a normal egg.

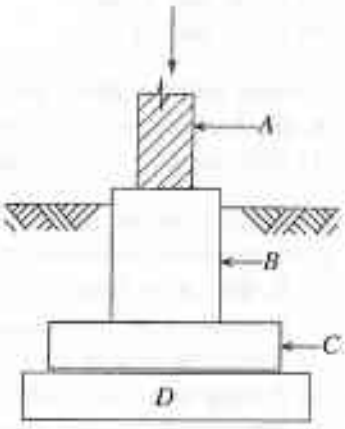
A - The load *P* is resisted by the egg shell only.
B - The egg shell is subjected to a tensile stresses.
C - The egg shell is weak when *P* acts in a horizontal direction, towards the centre.
D - A uniform constant stress acts on the egg shell.

Which of the above statements represents the behaviour of the egg?

(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.

37. Figure shows the structural elements *A*, *B*, *C* and *D* of a shallow foundation. Which one of the following statements is **incorrect**?

(1) *D* has the lowest shear strength.
(2) The purpose of *B* and *C* is to distribute compressive stresses with depth.
(3) Compressive stress in *A* is greater than the compressive stress in *C*.
(4) *D* should be a well-compacted and well-draining material.
(5) Depth to the bottom of *C* should be approximately the width of *C*.



Figure

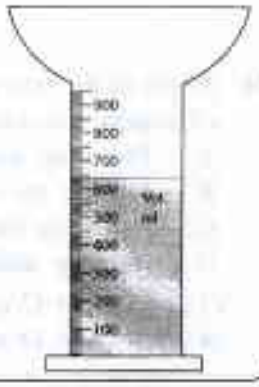
38. Which of the following advantages prompted Sri Lanka to promote separation of municipal waste at source?

A - To increase rapid degradation of organic waste in landfills and dump sites.
B - To prevent clogging of urban drains that causes hazards during flooding.
C - To facilitate resource recovery of metal, paper and glass products.
D - To reduce the net volume of refuse transported to landfills and dump sites.

(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) All A, B, C and D.

39. Figure shows a rain gauge used to measure daily rainfall. The measuring cylinder has a diameter of 60 mm and the funnel diameter is 120 mm. Water is collected up to 640 ml mark. The recorded rainfall in millimetres is

(1) 18.5.
(2) 32.8.
(3) 45.3.
(4) 56.6.
(5) 64.0.



[See page ten

40. For drinking water, which one of the following statements is **incorrect**?
(1) An increased Total Suspended Solids count causes high turbidity.
(2) A pH range of 5 to 6 is acceptable.
(3) A high content of chloride ions indicates high salinity.
(4) A high content of calcium ions indicates hardness in water.
(5) Unacceptable taste and odour in drinking water is caused by algae and bacteria.

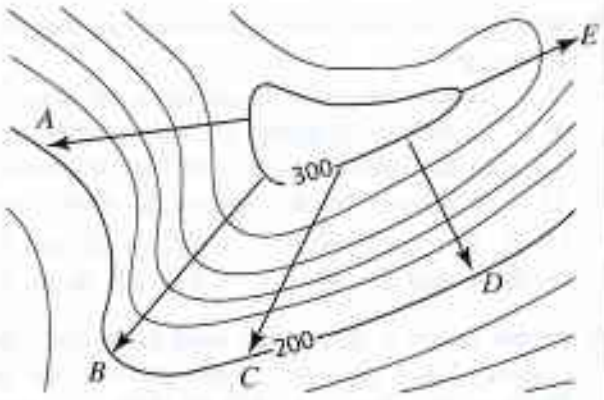
41. Regarding a domestic septic tank, which of the following statements are true?
A - The digestion process in the septic tank takes place under aerobic biological conditions.
B - Oil and grease form a floating scum, retained in the septic tank.
C - Decomposed sludge tends to settle at the bottom of the septic tank.
D - The retention time required for the digestion process should be 24 to 48 hours.
(1) A and B only. (2) B and D only. (3) A, B and C only.
(4) B, C and D only. (5) All A, B, C and D.

42. When pumping water to an overhead tank from a shallow groundwater well using a water pump located at ground level, which of the following does mechanical work against?
A - maximum depth to water table.
B - maximum pressure head of water column delivered.
C - velocity Head delivered.
D - head loss of the pump.
(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) All A, B, C and D.

43. A water meter reading display reads as '2257' in white background (i.e. the main scale) and '9446' in red background. The smallest volume of water that can be measured is
(1) 100 litres. (2) 10 litres. (3) 1 litre. (4) 0.1 litre. (5) 0.01litre.

44. Which one of the following answers explains the stress-strain behaviour observed in an annealed glass specimen subjected to a tensile test?
(1) It fails at a strain value similar to that of a mild steel specimen.
(2) It reduces its cross-section when a tensile stress is applied.
(3) It fails at a high yield stress at a low strain value, compared to a similar mild steel specimen.
(4) It fails at a low yield stress at a low strain value, compared to a similar mild steel specimen.
(5) When it fractures, it gives a smooth uniform failure surface.

45. Figure shows a segment of a contour map between contours 300 m to 200 m. The direction of maximum downward gradient is shown by
(1) A.
(2) B.
(3) C.
(4) D.
(5) E.



46. Which of the following tasks are performed by a Quantity Surveyor in a construction project?
A - Preparing tender documents for pricing
B - Valuing the construction works that were executed on the site
C - Assessing insurance claims
D - Keeping accident records and their payments
(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) All A, C, B and D.

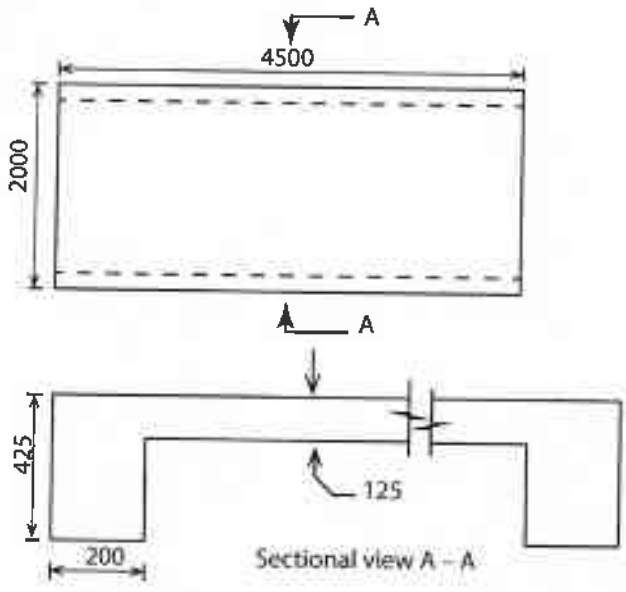
[*See page eleven*

47. A house with a total floor area greater than 1000 sq. ft. (93 m^2) is to be constructed in a coastal area, located within 300 m from the shoreline. The owner is required to obtain his building permit from
(1) the Municipal Council.
(2) the Coast Conservation Department.
(3) the Urban Development Authority.
(4) the Sri Lanka Land Reclamation and Reconstruction Authority.
(5) the Central Environmental Authority.

48. During construction of walls, which of the following guidelines are recommended by the National Housing Development Authority?
A - Thickness of load bearing walls and/or external walls should not be less than 200 mm.
B - 'Mud' walls and the use of low strength mortar mixes should not be used.
C - A cement/sand mortar mix leaner than 1:10 can be used.
D - Free standing height should not be greater than 3 m.
(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) All A, B, C and D.

49. When lifting heavy weights in a construction site, which of the following statements, one should comply with?
A - During hand lifting, one's back should be maintained straight without twisting.
B - Use handles and pulleys to assist the lift.
C - Avoid lifting above the shoulder level.
D - Lift loads in several parts.
(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) All A, B, C and D.

50. A slab panel is shown in the figure.



All dimensions are in millimeters. Not drawn to scale.

Required concrete volume is
(1) 1.13 m^3. (2) 1.40 m^3. (3) 1.51 m^3. (4) 1.67 m^3. (5) 3.83 m^3.

* * *

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka
අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2018 අගෝස්තු
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2018 ஓகஸ்ற்
General Certificate of Education (Adv. Level) Examination, August 2018

සිවිල් තාක්ෂණවේදය II குடிசார்த் தொழினுட்பவியல் II Civil Technology II	14 E II	16.08.2018 / 13 00 - 16 10

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 and decide on the questions that you give priority in answering.

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	

[see page two

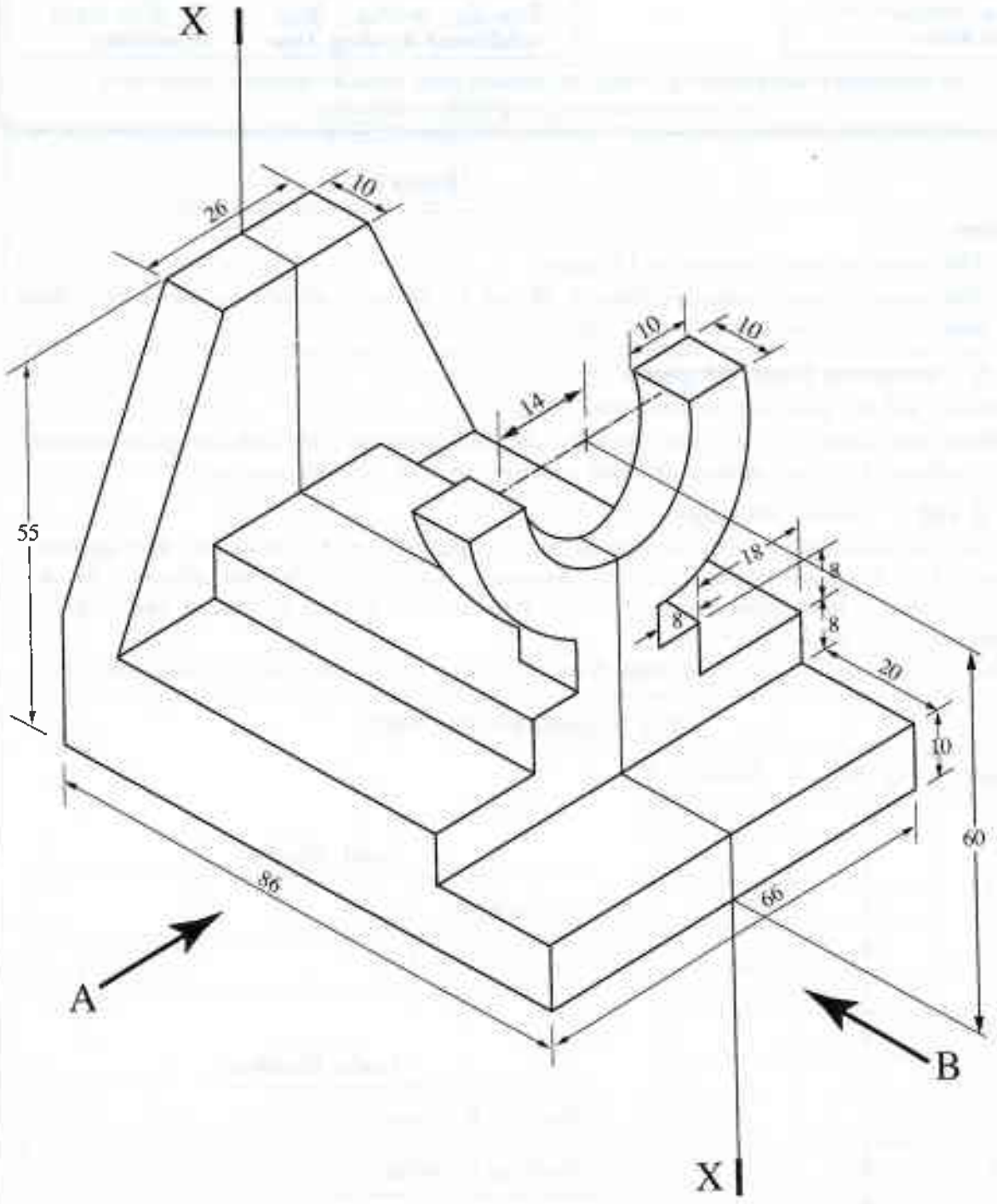
Do not write in this column

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. Machine component 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 sketches. 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.

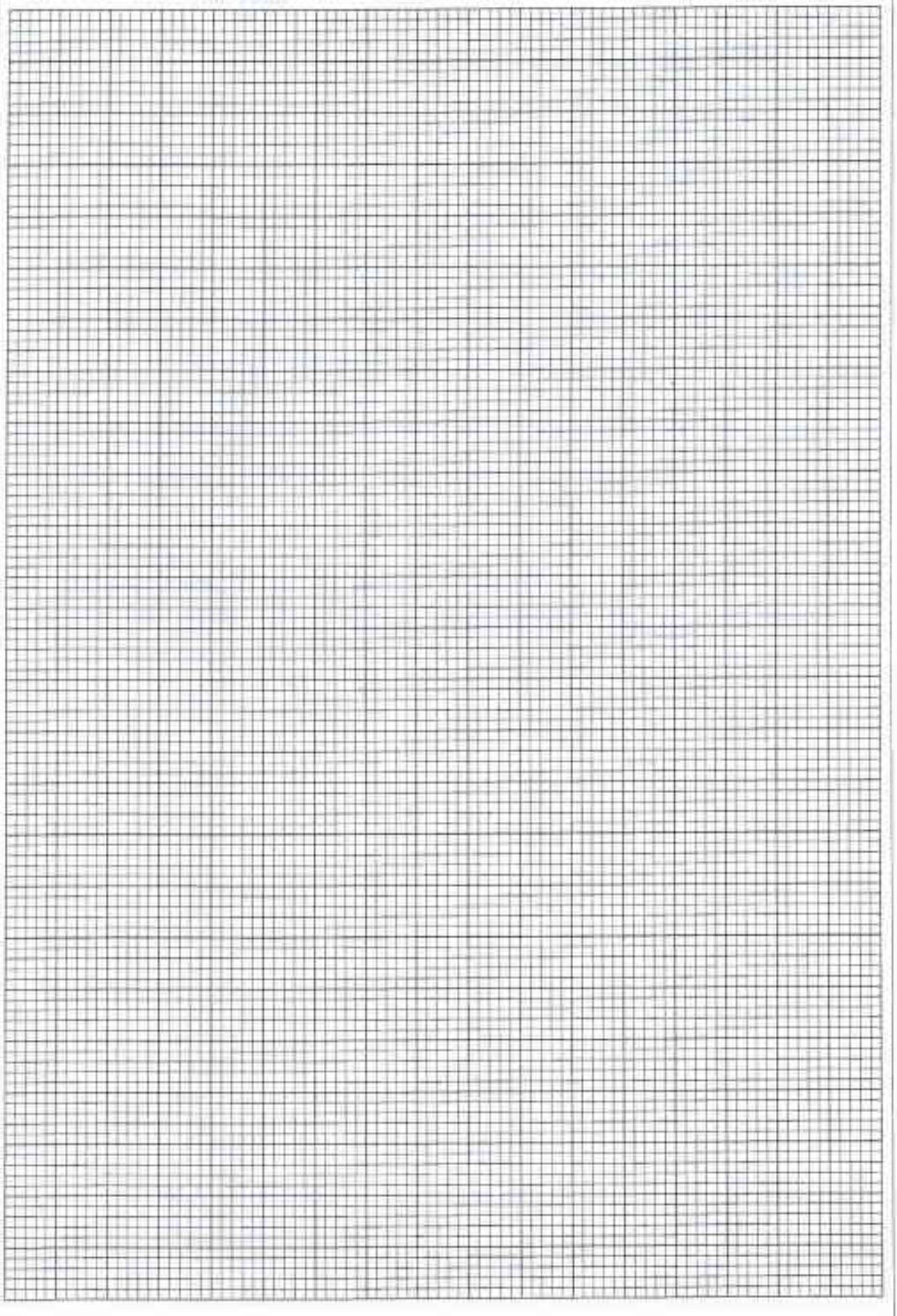
(ii) End elevation seen through direction B.

(iii) Plan view.

[see page three

Index No. : .....

{see page four



[see page five

0050

Do not write in this column

2. Assume that you have been appointed as the IT technical officer responsible for improving IT facilities of a school. Answer the following questions related to IT facilities.

(a) School has decided to establish a computer laboratory with 25 desktop computers. This laboratory will be used as a common facility for all students. The laboratory should include facilities for preparing documents, presentations and searching information in the Internet.

(i) State **four** hardware units required for a fully functional computer.

(1) .....

(2) .....

(3) .....

(4) .....

(ii) Give **two** software required for the computer units.

(1) .....

(2) .....

(iii) State **one** facility required for the computers.

.....

(b) It has been decided to improve the computer laboratory to facilitate programs conducted by teachers for other schools in remote areas through video conferencing.

(i) Name **two** additional hardware required for the computer laboratory in addition to the fully functional computers.

.....

.....

.....

(ii) State **one** software package required to carry out video conferencing.

.....

.....

(c) Assume that a project is being conducted by a group of 10 students under the supervision of a teacher from a school in a remote area, students are working in computer laboratory of the school and the teacher is at another school. Furthermore, assume that relevant hardware and internet facilities are available for the teacher and the students. State required software facilities for simultaneously preparing a report by 10 students and as the teacher can comment while preparing the report.

.....

.....

.....

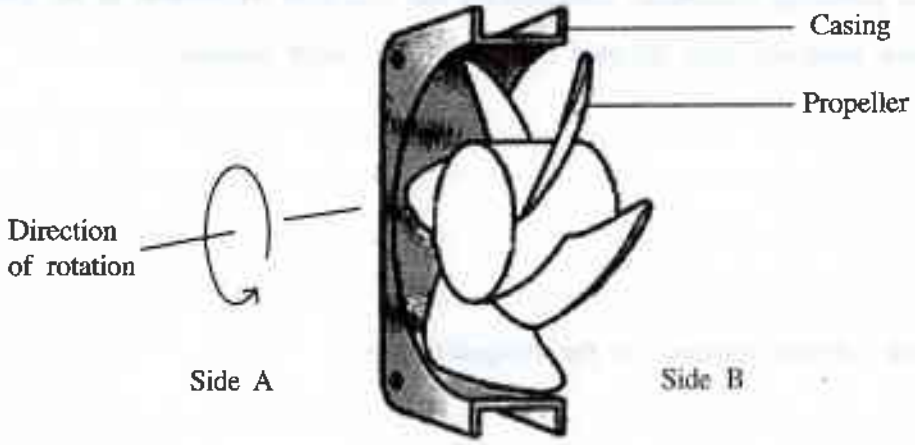
.....

.....

[see page six

Do not write in this column

3. Figure shows a schematic view of an extractor fan used in a rest room of size 3m×2m×3m of a sports complex. The fan is affixed to an external wall opening. The fan extracts moist-air out of the rest room at 54m^3/hr (15 *l*/s); at 5W and 240V. The propeller and casing mounts are **not** shown in the figure.



(a) Draw a sketch to show where you would locate the extractor fan in the external wall of the rest room.

(b) Explain why the given direction of rotation results in an air-draft towards Side A.

.....

.....

.....

.....

.....

(c) When the fan is functioning, show the direction of the force acting on the propeller blades and the casing respectively.

[see page seven

Do not write in this column

(d) State the types of stresses acting on the propeller blades.

.....

.....

(e) By using the fan it is expected to empty 25% of free-space of the rest room, every 15 minutes. Compute the number of minutes the fan has to function during every 15 minutes.

.....

.....

.....

.....

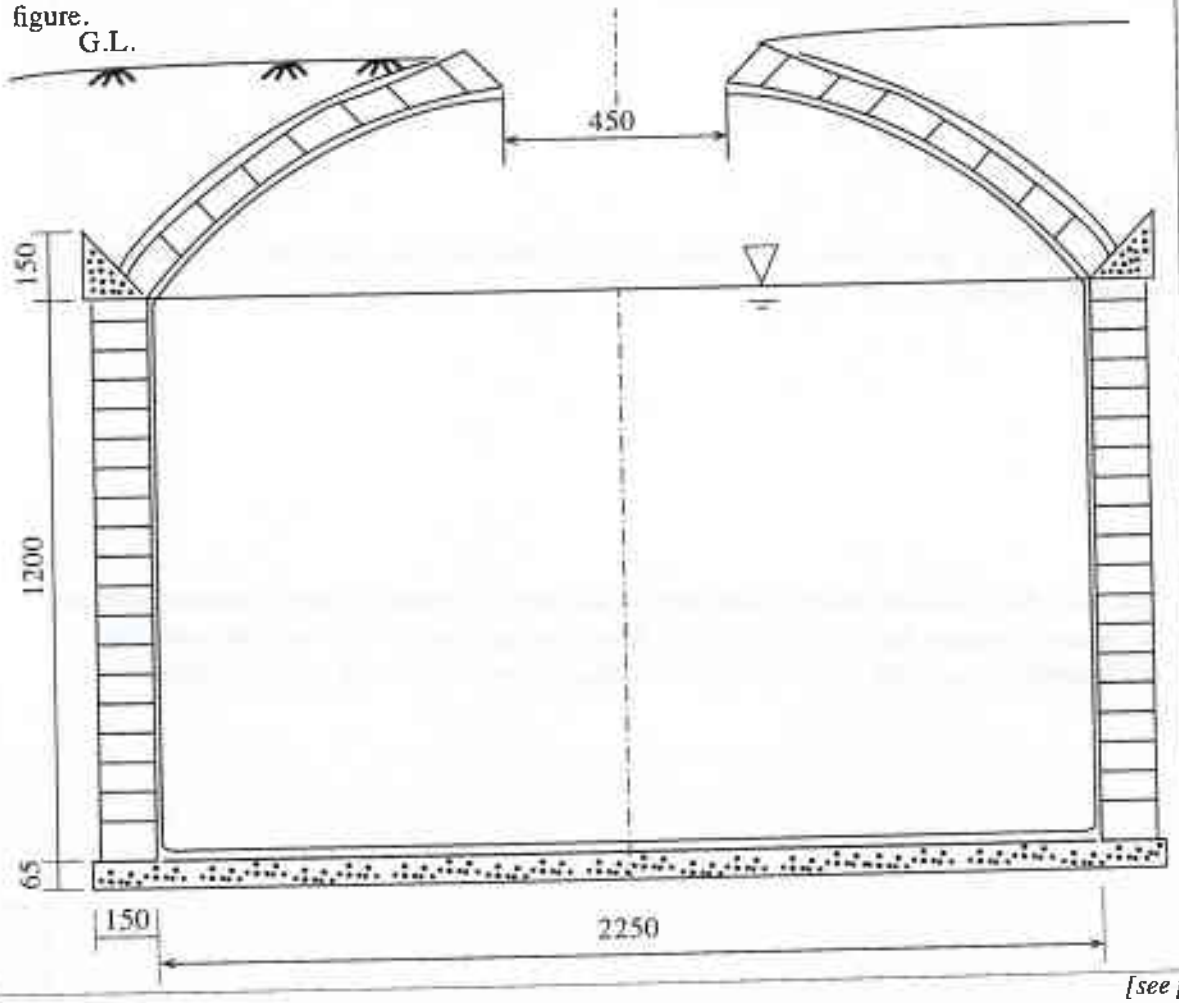
.....

(f) When the extractor fan is affixed to the external wall opening, which side (A or B) faces the rest room? State reasons for your answer.

.....

.....

4. Figure shows a schematic cross-section of an underground water collection tank used to harvest rainwater from the roof of a domestic dwelling. Both the cylindrical portion and the circular dome shaped cover of the tank is made of a single-brick stretcher bond. Water is filled up to the top level of the cylindrical tank. All dimensions are in millimetres in the figure.



[see page eight

Do not write in this column

(a) Name the various structural elements of the tank in the above sketch, using standard descriptions.

.....

.....

(b) Compute the maximum recommended volume of water that can be stored in this tank, based on the maximum water level shown in the figure.

.....

.....

(c) Explain how one could ensure that the water level inside the tank does **not** exceed the total height of the cylindrical wall. Assume that the proposed tank is filled through the central opening. Candidates are expected to mark the mechanism on figure in support of the written response.

.....

.....

.....

.....

.....

(d) Show, using a sketch how one could construct the cylindrical wall in an efficient manner.

(e) Show, using a sketch how one could construct the circular dome-shape cover in an efficient manner.

(f) You may have noticed that the brick dome can carry a certain uniformly applied load on it, without causing any structural failure. Show, using a sketch how this imposed load is transmitted through the brickwork of the circular dome eventually to its foundation.

* *

[see page nine

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
Department of Examinations, Sri Lanka
අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2018 අගෝස්තු
கல்விப் பொதுத் தராதர பத்திர (உயர் தர)ப் பரீட்சை, 2018 ஓகஸ்து
General Certificate of Education (Adv. Level) Examination, August 2018

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. The dengue fever has become an epidemic in Sri Lanka during the past few years. The fever is spreading rapidly, specially in slum areas. This situation has posed many challenges for controlling the spread of disease, in inter and intra regional communities.

   (a) In order to curb this epidemic, following actions could be taken.
   ① To control breeding of mosquito carrying the virus
   ② To keep away the mosquito carrying the virus
   ③ To prevent spreading virus to inter regions

   Briefly explain **two** suitable technological measures you could take with regard to
   (i) above ① at the school.
   (ii) above ② at your home.
   (iii) above ③.

   (b) You are appointed to educate the people in slum areas to control the epidemic within their own community. Briefly explain how you could use technology to make people aware to control this.

2. A smart building is a new concept in the today's world with prime objectives such as saving energy and contributing to achieve the sustainability goals. In order to achieve sustainability goals the design of the electrical system is very important. Assuming that you are the technical officer in a smart building project, answer the following questions. Main electricity consuming equipment in the building is identified as below.

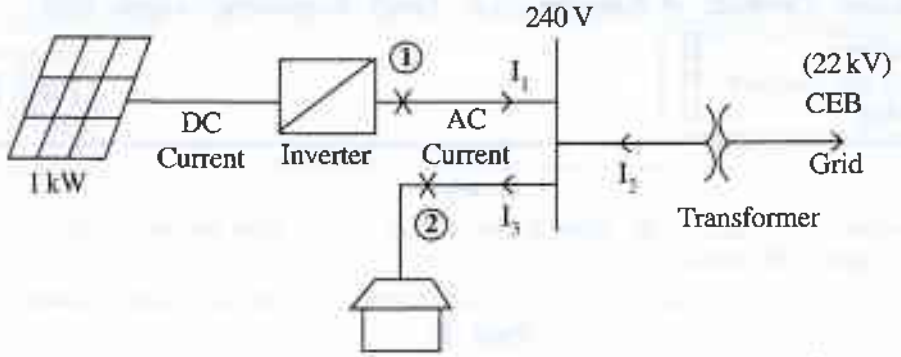
Equipment	Power	Quantity	Average daily usage (hours)
Bulbs	20 W	5	7
	100 W	2	2
Air Condition	4 kW	1	6
Refrigerator	100 W	1	15
Others	200 W	1	5

   (a) What is the total daily electricity consumption in kWh?
   (b) Calculate the maximum possible current taken by the building assuming 240 V supply voltage?
   (c) A single phase transformer is used to supply the above current. What is the minimum capacity of the transformer needed in kW?

[see page ten

(d) In order to convert the building into a sustainable building the owner is suggested to use solar energy from a roof-top 1kW photovoltaic (PV) plant. It will generate energy for 4 hours per day. The generated electricity will be sold to Ceylon Electricity Board (CEB) with the rate of Rs. 20 per kWh. Calculate the total income per month of 30 days from solar energy.

(e) Details of 1kW PV plant is given below.



(i) Find the maximum possible AC current generating from the PV plant.

(ii) Find the suitable rating of the fuses at point ① and ② .

3. A rural household receives pipe borne potable quality water, under gravity, from a community water supply scheme. It delivers water at daily, an average rate of 2 litres per minute, for a period of 5 hours, from 10 p.m. to 3 p.m.

The household has two adults, and three children of school going age and water is used for drinking, cooking, washing clothes, sanitary requirements and for home gardening.

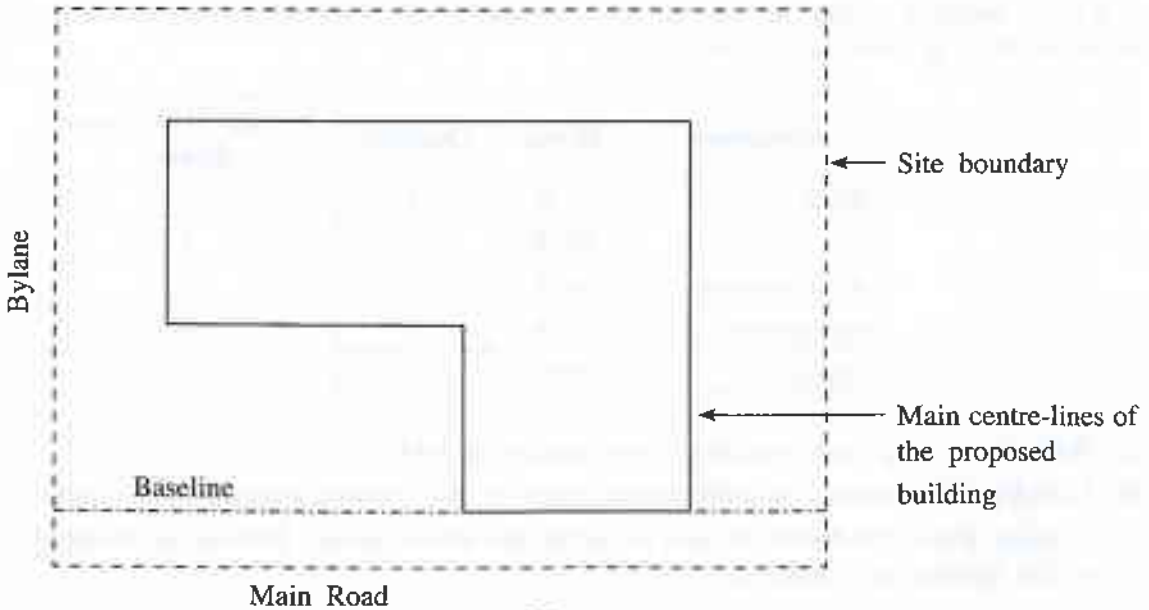
(a) Estimate the daily household water requirement for each purpose listed above, stating the assumptions you have made.

(b) Show on a sketch the layout of the water storage and distribution system for this dwelling. Name the components of the system while stating their specific use.

(c) Suppose that the household wishes to collect rain water to enhance its water needs. Propose how you would integrate the rain water collection system, to meet the domestic water needs. Use of sketches is expected to convey the proposal.

Part C

4. Figure shows a plot of land where a 2-story office furniture outlet is to be constructed.



Figure

[see page eleven

(Candidates are expected to sketch the figure on the answer script, and use it when responding to sections (a), (b), (c) and (d).)

(a) Explain the procedure for setting-out the base-line while highlighting on the equipment and accessories you intend to use.

(b) Explain the procedure for setting-out the building centreline while highlighting on the equipment and accessories you intend to use.

(c) Explain the procedure for checking the building centreline while highlighting on the equipment and accessories you intend to use.

(d) A shallow footing with a width of 0.75 m is to be laid at a depth of 0.75 m below ground level. Explain how you intend to set out the excavation width and depth, while highlighting on the equipment and accessories you intend to use.

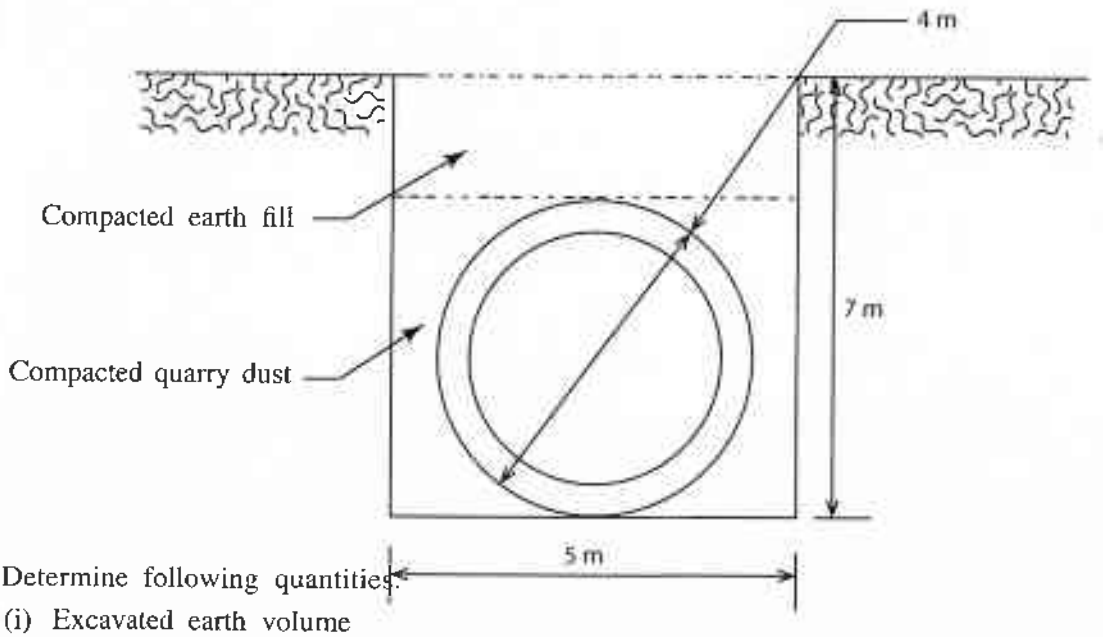
5. United Nation's Sustainable Development Goals (SDGs) requires Sri Lanka to meet Goal No.12, which is on "Responsible Consumption and Production". Under this goal, material consumption per person and the domestic material consumption per Gross Domestic Product (GDP) need to be reported. The Domestic Material Consumption is calculated in metric tonnes, as **direct imports of material + domestic extraction of materials - direct exports of material**. Sri Lanka is expected to reduce generation of waste substantially, through reduction, recycling and reuse by year 2030.

(a) Write a short essay on **one** of the below mentioned topics, in meeting SDG Goal No. 12, by year 2030.

(i) The use of reinforced concrete in a two-storey building
(ii) A comparison between the use of burnt clay bricks versus cement blocks
(iii) The use of water in various processes in building construction

(b) The use of harvested rainwater in office building and domestic dwellings is an important intervention towards meeting SDG Goal No. 12. Discuss ways in which this practice would assist in responsible consumption and production.

6. A concrete tunnel, 10 m long, has been constructed to divert water from one reservoir to another. A cylindrical section of 2m length, 0.3m thickness is casted using steel formwork; steam cured for 2 weeks, then placed in the excavation as shown in figure. Having joined the segments together, the excavation is backfilled using compacted quarry dust.



(a) Determine following quantities:

(i) Excavated earth volume

[see page twelve

(ii) Concrete volume of the tunnel
(iii) Compacted quarry dust volume
(iv) Compacted earth fill volume

(b) The Consultant requires the average compressive strength of concrete cubes tested to be 10% more than the designed concrete strength of 35 N/mm^2. Write a standard specification to ensure that the contractor meets the said requirement, during concreting.

* * *