

## නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus


 ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව  
 திணைக்களம் இலங்கைப் பரீட்சைத் 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  
 இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம்

අධ්‍යයන පොදු සහකික පත්‍ර (උසස් පෙළ) විභාගය, 2020  
 கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020  
 General Certificate of Education (Adv. Level) Examination, 2020

ඉංජිනේරු තාක්ෂණවේදය II  
 பொறியியற் தொழினுட்பவியல் II  
 Engineering Technology II

65 E II

පැය තුනයි  
 மூன்று மணித்தியாலம்  
 Three hours

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

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

Index No. : .....

## Important :

- \* This question paper comprises of four parts, A, B, C and D. The total time allotted for all four parts is three hours.
- \* Use of non-programmable calculators is allowed.

**PART A – Structured Essay :**  
( pages 2 - 8)

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

**PARTS B, C and D – Essay :**  
( pages 9 - 14)

Essay question paper contains six questions, Answer four questions selecting at least one question from each part. Use the papers supplied for this purpose.

At the end of the time allotted for this paper, tie the four parts A, B, C and D together as a single answer script so that Part A is on top and hand it over to the supervisor.

## For Examiners' Use Only

## 65 - Engineering Technology II

Part	Question Nos.	Marks Awarded
A	1	
	2	
	3	
	4	
B	5	
	6	
C	7	
	8	
D	9	
	10	
Total		

## Total

In numbers	
In words	

## Code Number and Signature

Marking Examiner 1	
Marking Examiner 2	
Marks checked by	
Supervised by	

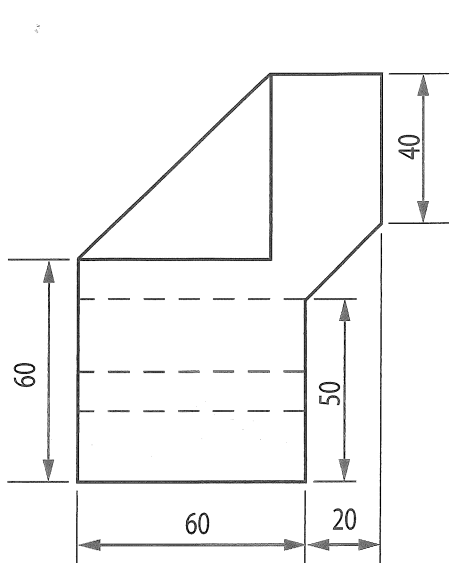
**PART A – Structured Essay**

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

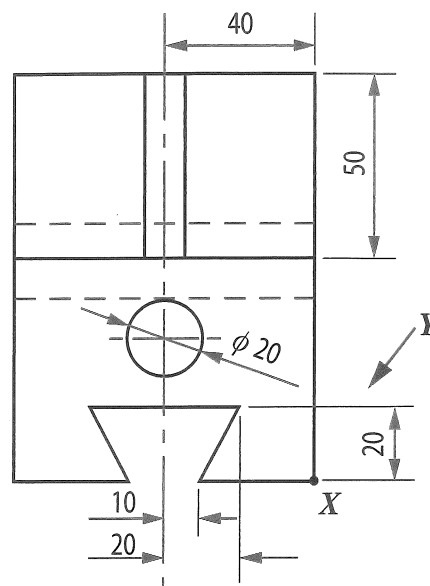
(Marks allocated for each question is 75.)

1. The front view, side view and plan of a steel machine part drawn using first-angle projection are shown in the figure. This machine part is symmetric about the shown centre line. The drawings given are not to scale. Using free hand, draw the isometric view of the machine part in the dot sheet provided taking the corner shown by X as the origin, looking in the direction shown by the arrow Y. Mark all the given dimensions in the isometric drawing. Make the origin X of the drawing coincide with the origin X shown in the dot sheet. It is not necessary to show hidden lines in the isometric drawing and to use isometric scale. When drawing, consider the distance between two adjacent dots on the dot sheet as 10 mm.

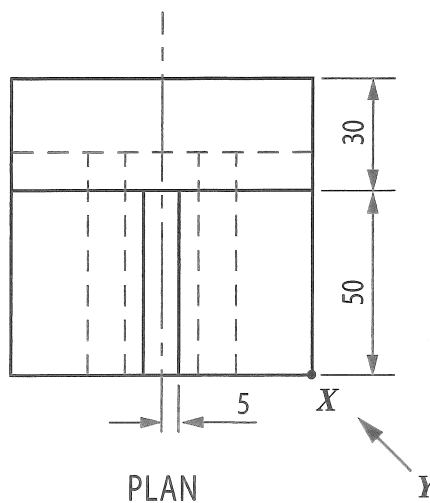
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SIDE VIEW

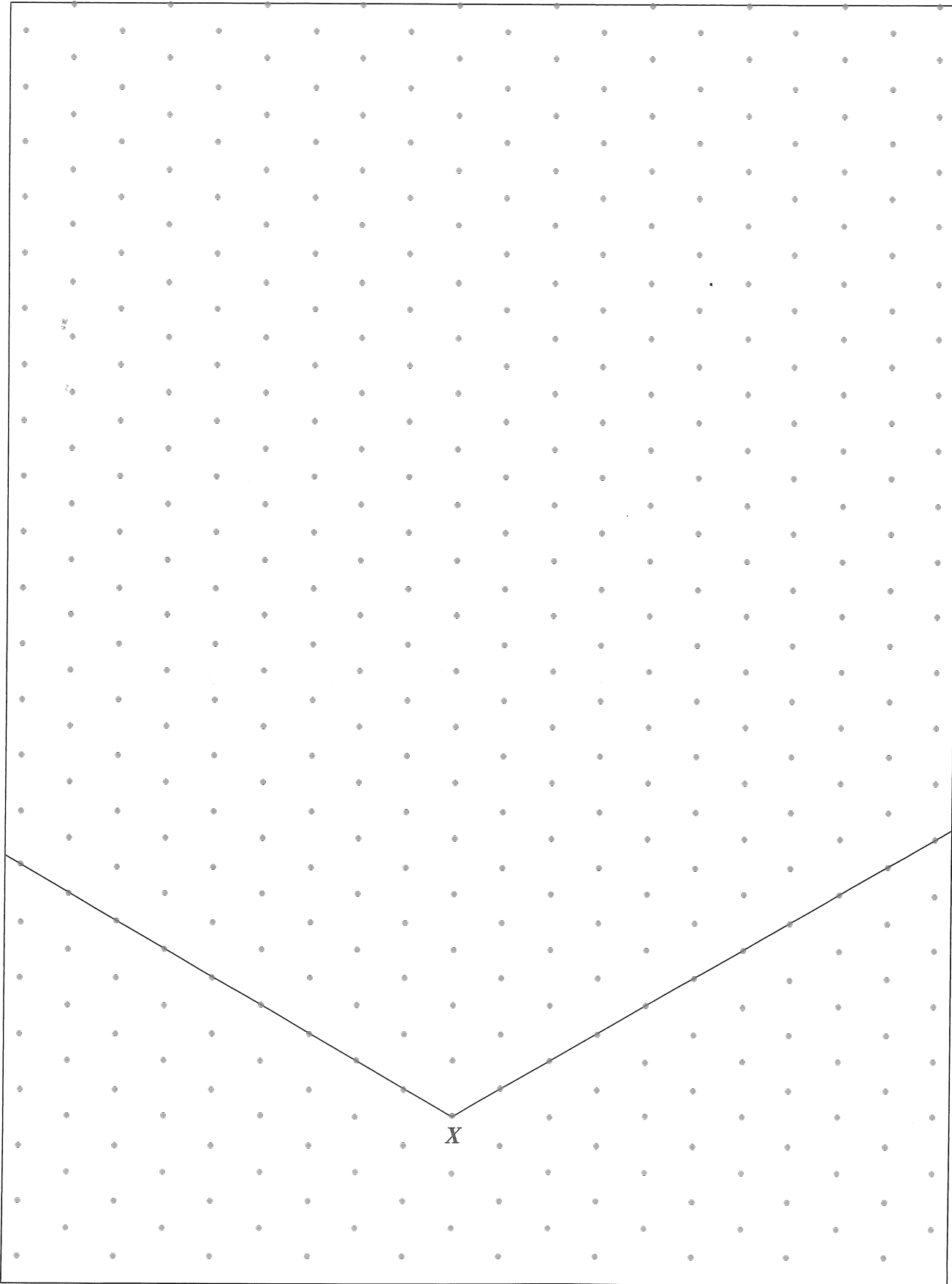


FRONT VIEW



PLAN

(75 marks)



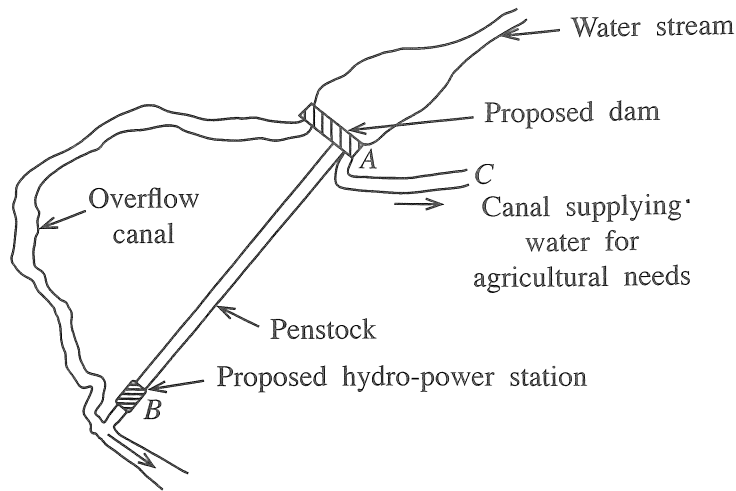
For use of the examiners	Marks
Drawing straight lines (54 Marks)	
Drawing curves and centre lines (04 Marks)	
Marking of straight line dimensions according to the standard (13 Marks)	
Marking dimensions of curves according to the standard (04 Marks)	

Q. 1  
\_\_\_\_\_  
75

[see page four

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2. It has been proposed to construct a dam across a water stream at place A and construct a hydro-power plant at B as shown in the figure. By this project, it is expected to generate hydro electricity to feed the national electricity grid system and supply water for the agricultural needs of the area through the canal shown by C.



(a) (i) For planning the project comprehensively and in full detail, it is required to prepare a plan of the site. What is the type of surveying that should be used for this?

.....  
(05 marks)

(ii) If the scale used for drawing the survey plan is 100 m to 1 cm, indicate this scale as a ratio.

.....  
(05 marks)

(iii) A measuring tape cannot be used to measure the slope distance between the dam and the power station, for calculating the length of the penstock. Name a survey instrument that can be used for this.

.....  
(05 marks)

(b) (i) It has been proposed to test the concrete mixtures used for constructing the above dam on site to decide the suitability for use.

(1) What is this test?  
.....  
(05 marks)

(2) Which property of concrete is measured here?  
.....  
(05 marks)

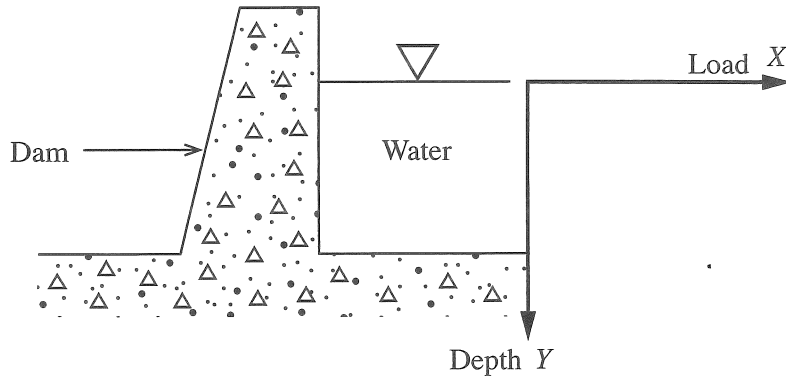
(ii) What are the machinery used for the following activities in constructing the dam, which is a large scale civil engineering project?

Activity	Machinery
Transporting concrete	.....
Pouring concrete mixture to the correct place	.....

(10 marks)

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(iii) The figure shows a cross-section of the above dam A. Draw on the X-Y plane, the variation of the load, imposed by water on the dam, with the depth.



(05 marks)

(c) The water supplied by the canal C is proposed to be supplied as drinking water to a community area. However, this water cannot be supplied directly as drinking water and it is required to subject to a purification process.

(i) Write a property that may **not** be present in water flowing in the canal but relevant for the quality of drinking water.

.....  
(05 marks)

(ii) Name a purification method to obtain the property mentioned in (c)(i).

.....  
(05 marks)

(d) (i) The water head of the proposed hydro-electric power station is 70 m. What is the type of turbine that is most suitable for the power station?

.....  
(05 marks)

(ii) The voltage generated by the power station is 6.6 kV. In order to connect this to the national electric power transmission system, what is the type of transformer that should be used?

.....  
(05 marks)

(e) (i) If the flow rate of water through the penstock of the power station is  $0.5 \text{ m}^3 \text{ s}^{-1}$ , water head 70 m and the efficiency of the turbine 85%, how much would be the electricity generating capacity in kW?

(Consider the density of water as  $1000 \text{ kg m}^{-3}$  and acceleration due to gravity as  $10 \text{ m s}^{-2}$ .)

.....  
.....  
.....  
(10 marks)

(ii) The power station runs 10 hours per day for 300 days in a year. How much is the amount of electrical energy generated by the power station in a year in kWh?

.....  
(05 marks)

Q.2

75

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3. It is required to transport raw materials from the ground floor to the second floor of a factory as shown in figure (1) below. The finished materials processed on the second floor are again brought down to the ground floor. An elevator that can be used for this purpose has to travel up and down many times during a day to perform such activity. The figure (2) shows the schematic arrangement of the mechanism used in the proposed elevator system. A drive system which is operated by an electric motor is proposed to be connected to pulley Y.

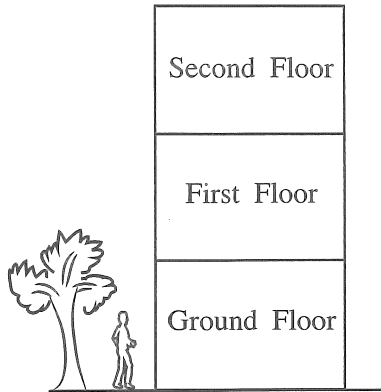


figure (1)

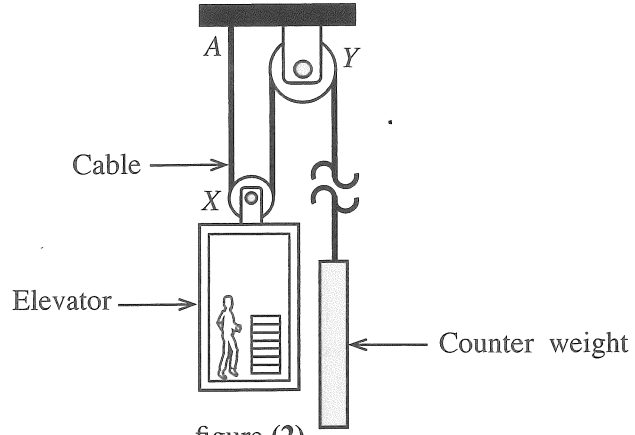


figure (2)

(Consider the acceleration due to gravity as  $10 \text{ m s}^{-2}$  for the calculations.)

(a) (i) State a benefit of using a counter weight in this elevator.

..... (05 marks)

(ii) The cable has been made with a number of wire strands with small cross-sectional area. State **two** reasons for this.

(1) .....  
 (2) ..... (10 marks)

(iii) The mass of the counter weight is 100 kg and the mass of the elevator is 200 kg. When the elevator is moving at a constant velocity while carrying the maximum mass of 500 kg that can be carried, how much will be the tensile force in Newton (N) in cable section A? Neglect the mass of the cable and bearing frictional forces.

..... (15 marks)

(iv) Under the situation referred to in (a)(iii) above, when the elevator is moving up at its maximum velocity of  $0.4 \text{ m s}^{-1}$ , calculate the power delivered by the motor in kW.

..... (15 marks)

(v) The power of the required motor has been estimated to be 50% more than the calculated power in (a)(iv) above. State a reason for this.

..... (05 marks)

Do not write in this column

(b) Three light emitting diodes ( $D_0$ ,  $D_1$  and  $D_2$ ) (LED) are used to indicate the floor that is being passed by the elevator. Floors are identified using a sensor system which gives three signals  $S_0$ ,  $S_1$  and  $S_2$ .

When the elevator is in ground floor ( $S_0=1, S_1=0, S_2=0$ ), only  $D_0$  LED is ON, when in first floor ( $S_0=0, S_1=1, S_2=0$ )  $D_0$  and  $D_1$  are ON and when in the second floor all ( $S_0=0, S_1=0, S_2=1$ )  $D_0, D_1$  and  $D_2$  are ON and under any other conditions, all the LEDs should be OFF.

(i) Construct the truth table in relation to the above LED operation.

$S_0$	$S_1$	$S_2$	$D_0$	$D_1$	$D_2$

(15 marks)

(ii) Derive the Boolean expression in relation to  $D_0$  LED operation.

.....  
(05 marks)

(iii) Design the logic circuit in relation to  $D_0$  LED operation.

.....  
(05 marks)

Q.3

75

4. Rani who was working as an experienced quality controller in a garment factory, was hoping to have her own manufacturing business someday. Having procured machinery required she started a business for manufacturing and selling face masks used for health and safety according to an international standard and resigned from her usual job. By this time she had only a very small amount of money as her personal savings. Later on several friends also joined to work in her business.

Answer the following questions based on the above case.

(a) (i) State **two** factors leading to identify Rani as an entrepreneur according to the definitions of entrepreneurship.

(1) .....  
(2) .....  
(05 × 2 = 10 marks)

(ii) State **two** aspects that should be considered in performing a competitive analysis for the face masks market.

(1) .....  
(2) .....  
(05 × 2 = 10 marks)

Do not write in this column

(iii) Name **two** types of institutions which provide financial facilities for small scale entrepreneurs like Rani for starting up businesses.

(1) .....

(2) .....

(05 × 2 = 10 marks)

(iv) State a business risk which is likely to be faced by Rani and propose an action that can be taken to control the risk.

Risk : .....

Action : .....

(05 × 2 = 10 marks)

(v) If face masks are manufactured in large quantities mention an organised selling method that can be employed.

.....

(05 marks)

(b) (i) State a reason for the high demand for face masks that are manufactured according to a standard.

.....

(05 marks)

(ii) State a method that can be used for checking, in a single setting, whether several dimensions of manufactured face masks are within specified tolerance limits.

.....

(05 marks)

(iii) Mention a hazard and a risk to the health of the workers, caused by dust producing materials used in apparel factories and state one technological method that can be used to control the hazard when designing factories.

Hazard : .....

Risk : .....

Action : .....

(05 × 3 = 15 marks)

(iv) Write down an aim of the government in initiating apparel factories in Sri Lanka.

.....

(05 marks)

\* \*

Q.4

75