89 E I, II

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கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2024(2025)
General Certificate of Education (Ord. Level) Examination, 2024(2025)

නිර්මාණකරණය හා යාන්ත්‍රික තාක්ෂණවේදය I, II
வடிவமைப்பும் இயந்திரத் தொழினுட்பவியலும் I, II
Design and Mechanical Technology I, II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

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

Use additional reading time to go through the question paper, select the questions and decide on the questions that you give priority in answering.

Design and Mechanical Technology I

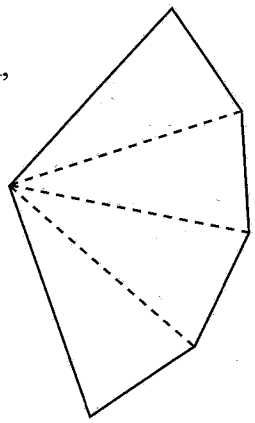
Instructions:

* *Answer **all** questions.*
* *In each of the questions **1** to **40**, pick one of the alternatives* (1), (2), (3), (4) *which is **correct or most appropriate.***
* ***Mark a cross** (×) **on the number corresponding to your choice in the answer sheet provided.***
* *Further instructions are given on the back of the answer sheet. Follow them carefully.*

1. The radius of one circle is 40 mm and the radius of another circle is 30 mm. If these two circles are to be tangent at one point, the length of the line to be drawn equal to the length between the centers of those two circles is

(1) must be 40 mm. (2) must be 60 mm.
(3) must be 70 mm. (4) must be 80 mm.

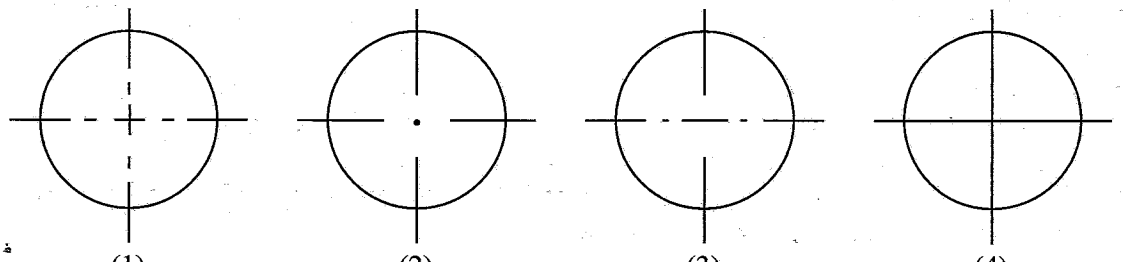
2. A geometrical figure in which the construction lines are not shown, is given below.



Above geometrical figure shows

(1) a development of a prism in which the sides of the plan are equal in length.
(2) a development of a pyramid in which the sides of the plan are equal in length.
(3) a development of a tetrahedron in which the sides of the plan are equal in length.
(4) a development of a tetrahedron in which the sides of the plan are not equal in length.

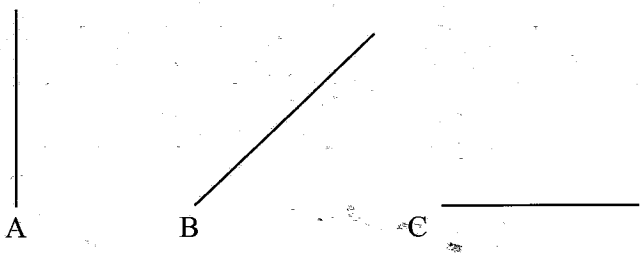
3. What is the correct figure which shows the standard lines when drawn across the center of the circle included in the front view or the side view or the plan of orthogonal projections?



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

[see page two

4. Three methods of constructing thick continuous lines which used in technical drawing are given in the figure below.



What is the option that includes the above A, B and C lines in order?
(1) Vertical line, oblique line, horizontal line
(2) Oblique line, vertical line, horizontal line
(3) Horizontal line, vertical line, oblique line
(4) Horizontal line, oblique line, vertical line

5. Which geometrical figure consist two focal points?
(1) Ellipse (2) Circle (3) Parabola (4) Segment of a circle

6. When piece of paper which has been cut in the shape of an equilateral triangle is divided into two symmetrically, the resultant figure is
(1) an isosceles triangular shape.
(2) scalene triangular shape.
(3) equilateral triangular shape.
(4) rectangular shape.

7. In manufacturing iron from iron ore using the process of blast furnaces, at where the slag iron exists?
(1) It floats on liquid iron
(2) It exists as a vapour of slag iron
(3) It exists in the bottom of the furnace
(4) It exists as a mixture with liquid iron

8. When a force is applied to a metal, it extends to a certain length and the metal will return into the previous state when the force is released. To which type of property of metals does this property belong?
(1) Electrical property
(2) Chemical property
(3) Mechanical property
(4) Physical property

9. What is the mechanism of giving power for the drilling machines which are used for difficult tasks such as excavation in the roads and drilling concrete?
(1) Hydraulic drive system
(2) Pneumatic drive system
(3) Chain and sprocket drive system
(4) Lever and cable drive system

10. Select the **wrong** statement about lubrication systems.
(1) In the petroil method, the mixing ratio between lubricating oil and petrol is 1:25.
(2) Some engines use external methods to lubricate the valve assembly of the engine head.
(3) Splash method was used to lubricate single cylinder engines in the early times of engine production.
(4) It is not needed to use new oil filters always in removing lubricating oil of an engine.

11. What is the first task to be done in repairing a driving chain of a motor cycle?
(1) Check whether the free flow of the driving chain is within 15 mm – 25 mm limit.
(2) Get confirm whether a mixture of lubricating oil and grease have being used to lubricate.
(3) Get confirm whether replacing only the sprocket wheel and drive chain are enough when the driving chain and sprocket wheel are worn away.
(4) Observe whether driving chain and two sprocket wheels are to be replaced when two sprocket wheels and driving chain are worn away.

[*see page three*

12. What is the suitable example for 3rd type of lever system?
(1) Turning a stone from a crowbar
(2) Use of wheelbarrow
(3) Lifting sand using a shovel
(4) Taking water from a well using a pulley.

13. What is the chemical formula of Acitiline?
(1) C_2H_2 (2) C_2H_4 (3) C_4H_2 (4) C_4H_4

14. What is the most suitable number range of sand papers to be used to make the surface ready before applying final paint in finishing metals?
(1) 60 – 80 (2) 120 – 180 (3) 320 – 400 (4) 1000 – 1200

15. What is the voltage difference in the circuit not in active mode in electrical arc welding?
(1) (80 – 100) V (2) (100 – 150) V (3) (150 – 170) V (4) (180 – 220) V

16. The suitable finishing method for tor steel when rusted is
(1) painting. (2) mechanical finishing.
(3) galvanizing. (4) sand blasting.

17. What is the most suitable method of painting a chassis of a vehicle in vehicle manufacturing?
(1) Applying talc paint. (2) Dipping method.
(3) Spray painting. (4) Oxidization.

18. What is the most suitable welding method to weld mild steel sheets in which thickness is less than 3 mm?
(1) Left hand welding (2) Right hand welding
(3) Cross position (4) Horizontal position

19. What is the mostly used metal because of its colour considering the properties of metals?
(1) Copper (2) Aluminium (3) Silver (4) Gold

20. The metal which used to manufacture measuring equipment is
(1) Iron-Nickel alloy. (2) Stainless steel.
(3) High Chromium steel. (4) Aluminium mixed metal.

21. The size of the angle of changing the direction of rotation using a worm and worm wheel is
(1) 45°. (2) 60°. (3) 90°. (4) 120°.

22. The horn relay which has four terminals and used in the vehicle horn circuit has a terminal marked as '85'. To where this terminal should be connected?
(1) To horn button
(2) To the positive terminal of the battery
(3) To the positive terminal which comes through ignition key
(4) To the negative terminal of the battery

23. What is the main element mixed with iron in steel manufacturing?
(1) Zinc (2) Manganese (3) Tin (4) Carbon

24. What is the class that brass and bronze belonged in metal classification?
(1) Mixed non-ferrous metals (2) Mixed ferrous metals
(3) Non mixed ferrous metals (4) Non mixed non-ferrous metals

25. The function expected to be accomplish by using flux in soft welding is
(1) to keep the heat for a long time.
(2) to hard the joint of the welding.
(3) to remove oxides in the welding joint.
(4) to cool the welding joint soon.

[see page four

26. The industry in which mostly use riveting to join different parts is
(1) Manufacturing boats.
(2) Manufacturing motor bicycles.
(3) Manufacturing motor vehicles.
(4) Manufacturing boilers.

27. What is the compound that use to keep the air pressure in uniform level in the air pressure systems which used in power transmission?
(1) Compressor (2) Pressure controller (3) Controlling valve (4) Safety valve

28. What is the formula which use to calculate the rate of velocity between the driven and drive pulleys or sprocket wheels.

(1) Rate of velocity = $\frac{\text{speed of the drive pulley}}{\text{speed of the driven pulley}}$

(2) Rate of velocity = $\frac{\text{speed of the driven pulley}}{\text{speed of the drive pulley}}$

(3) Rate of velocity = $\frac{\text{diameter of the drive pulley}}{\text{diameter of the driven pulley}}$

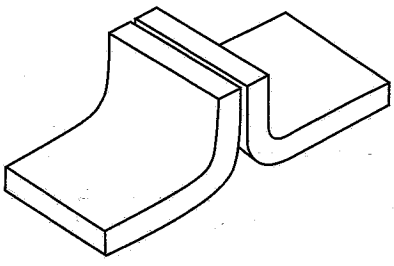
(4) Rate of velocity = $\frac{\text{diameter of the driven pulley}}{\text{diameter of the drive pulley}}$

29. Gagger is used in casting industry
(1) to arrange sand accordingly when preparing the mould.
(2) to compress moulding soil.
(3) to compress smooth soil and sand.
(4) to wet around the moulding pattern.

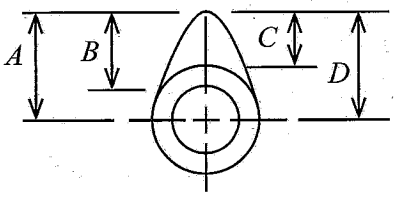
30. What is the mostly used metal in manufacture engine blocks, underground pipe lines, parts of bearings and machine parts?
(1) Cast iron
(2) High carbon steel
(3) Medium carbon steel
(4) Stainless steel

31. What is the experiment to be done to identify ferrous and non ferrous metals separately?
(1) Hold to a spinning fire stone
(2) Filing
(3) Cutting with a metal saw
(4) Heating

32. What is the joint shown by the figure?
(1) Simple butt joint
(2) Lap joint
(3) Edge joint
(4) U joint



33. A cam used for valve mechanism which is shown in the figure. Which letter shows the motion distance made by the cam?
(1) *A*
(2) *B*
(3) *C*
(4) *D*



[see page five

34. What is the special characteristic of an energy transmission system which use vaccume force?
(1) Low maintenance
(2) It can not transmit the energy for a longer distance
(3) It needs to keep an air pressure within the system
(4) It needs suction machine or a tool for the suction process.

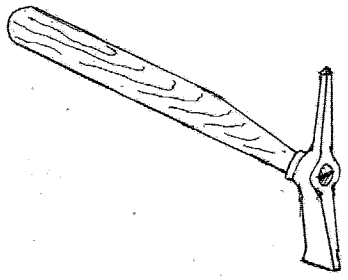
35. The suitable measuring instrument to measure the diameter of a circular steel rod most accurately is
(1) a micrometer.
(2) a vernier calliper.
(3) an outer calliper.
(4) a feeler gauge.

36. What is the colour of the water fire extinguisher which commonly use in fire extinguishing?
(1) Green (2) Black (3) Cream (4) Red

37. What is the name given for the process of manufacturing goods by heating metals up to their melting point and pouring it to the moulds?
(1) Welding
(2) Casting
(3) Extraction
(4) Drop forging

38. The ability of a metal to become liquid when heated to its melting point is known as which property of a metal?
(1) Ductility
(2) Malleability
(3) Fusibility
(4) Plasticity

39. What is the name of the tool shown in the figure?
(1) Ball peine hammer
(2) Cross peine hammer
(3) Straight peine hammer
(4) Crushed hammer



40. It needs to make a hole on the sheet in riveting. What is the dimensional relationship in between the diameter of the rivet stem of the rivet and the diameter of the hole?
(1) The hole should be 0.1 mm smaller.
(2) The hole should be 0.1 mm larger.
(3) The hole should be 0.2 mm smaller.
(4) The hole should be 0.2 mm larger.

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[see page six

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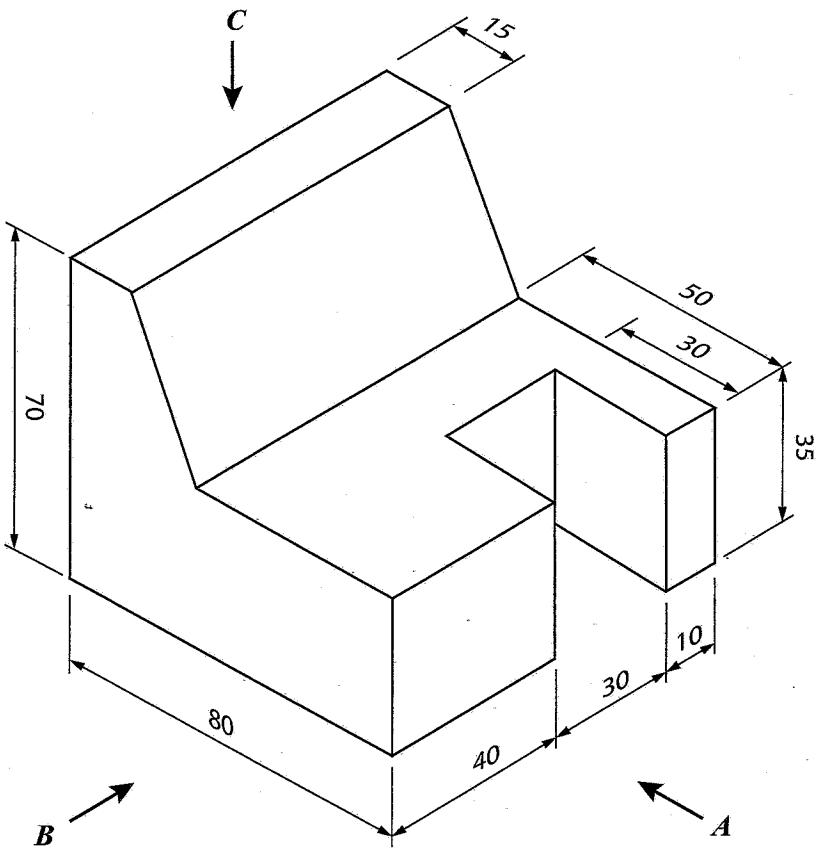
வடிவமைப்பும் - இயந்திரத் தொழினுட்பவியலும்	I, II
Design and Mechanical Technology	I, II

Design and Mechanical Technology II

* *Answer* ***five*** *questions including the* ***first*** *question and* ***four*** *other selected questions.*
* *Question No.***1** *carries* **20** *marks and each of the other selected questions carry* **10** *marks each.*

1. (i) The following figure shows an isometric view of an object.
According to the above isometric view, draw the followings in third angle orthographic projection as per given measurement. The scale to be used is 1:1.

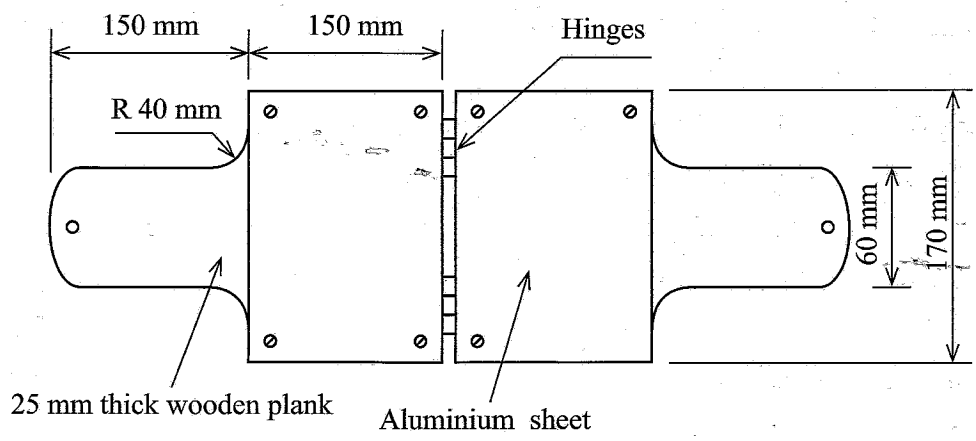
(1) Front elevation by looking at arrow ***A***
(2) Side elevation by looking at arrow ***B***
(3) Plan by looking at arrow ***C***

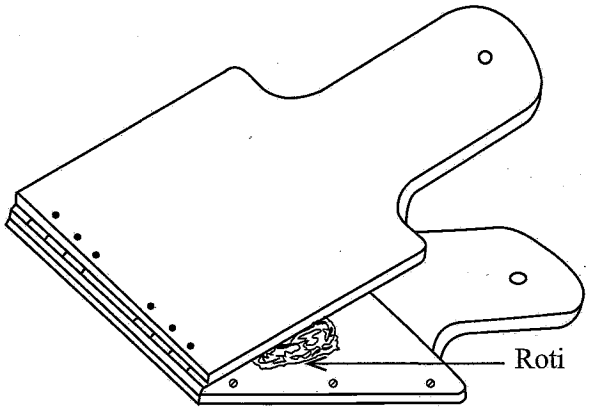


(ii) According to any standard method, draw an ellipse with the major axis is 80 mm and the minor axis is 50 mm. Construction lines should be clearly shown. Name the relevant method used to construct an ellipse by you.

[see page seven

2. It is entrusted to the technical unit to design an equipment which prepares roti quickly for the cafeteria that managed by the school welfare society. The plan of the designed equipment is given in the following diagram. Tools, equipment wooden planks and metal sheets which can be provided by the technical unit is given below.





- ✻ 25 mm thick wooden planks
- ✻ Pair of brass back flap hinges that 50 mm in length and matching screws
- ✻ 1 mm thick aluminium sheet
- ✻ Tools and equipment of cutting, drilling and fixing
- ✻ Finishing materials
- ✻ Measuring and marking tools

(i) Name **two** alternative materials which can be found from the surrounding environment to use instead of these hinges.

(ii) Describe the process to be followed when creating this roti making machine step by step mentioning the tools and equipments for each task.

(iii) Giving diagrams, describe **two** method of fixing aluminium metal sheets to the wooden part of the roti making machine which prevent the roti dough sticking to the wooden parts.

3. The riveting can be considered as a process of connecting two or more sheets using rivets.

(i) State **four** instances where riveting is used for connect parts.

(ii) Prepare a list of tools and equipments which used for the process of riveting.

(iii) Describe briefly with figures the process of riveting sheets.

[*see page eight*

4. Electric arc welding is a commonly used welding method.
   (i) Name tools, materials and equipment which are used in electric arc welding method.
   (ii) Write **three** facts which influence on a good electric arc welding.
   (iii) Describe **three** functions that fulfil by the flux which are applied around the welding rod.

5. An electrical system is used to operate different parts in a motor bike.
   (i) State **three** errors which could be occurred in the electrical system of a motor bike.
   (ii) Describe the process of correcting those errors mentioned in above (i).
   (iii) Draw and label the parts of a circuit diagram of brake light system in a motor bike.

6. The goods manufactured using casting method are used for different needs of daily life.
   (i) Write **four** advantages of manufacturing goods using casting method.
   (ii) Write **three** defects which can be seen in goods manufactured using casting method.
   (iii) Explain using figures the process of removing the mould pattern made by wax from the mould.

7. When operating the machines, different machine parts are having different motion types.
   (i) Write the **four** fundamental motion types.
   (ii) Illustrate the mechanism of motion transformation using a diagram.
   (iii) Describe the fundamentals included in the problem solving method when constructing models for motion transformation.

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