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கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2023(2024)
General Certificate of Education (Ord. Level) Examination, 2023(2024)

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

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

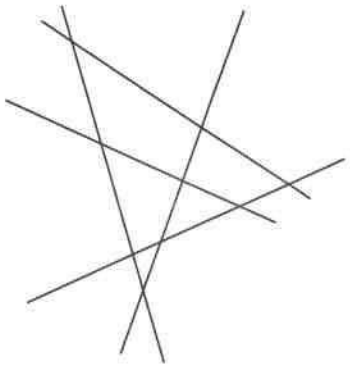
අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

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

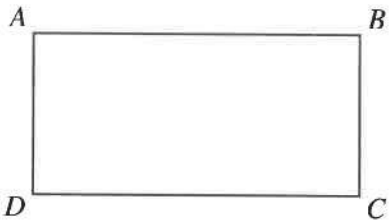
Instructions:

* *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 figure shows the arrangement of five ekels when they are dropped on to a table by accidentally. The geometrical shapes that can be seen on the figure are

(1) triangles and squares.
(2) squares and pentagons.
(3) triangles and rectangles.
(4) pentagons and hexagon.

2. 

The geometrical shape that can draw to just touch the all four lines *AB*, *BC*, *CD* and *DA* of the given rectangle is

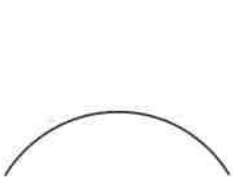
(1) an isosceles triangle.
(2) a scalene triangle.
(3) a circle.
(4) an ellipse.

3. What is the factor that unable to draw a circle when only one of the factor is given from the following?

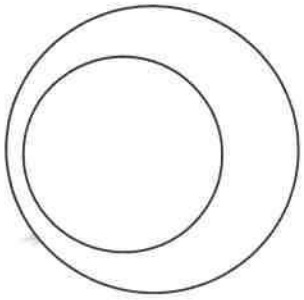
(1) Center (2) Radius (3) Diameter (4) Circumference

[*see page two*

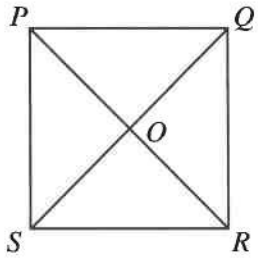
4. Three statement are given in relation to the figures L, M and N below.



L



M



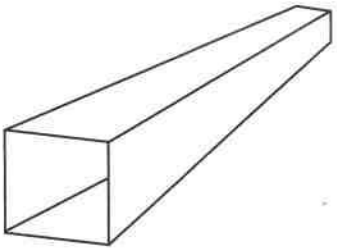
N

A – It is unable to find the center to draw arc L at all.
B – There are two separate centers for each two circles at figure M.
C – O should be used as the center to draw a circle which just touches the points of $PQRS$ square in figure N.

The correct statements are

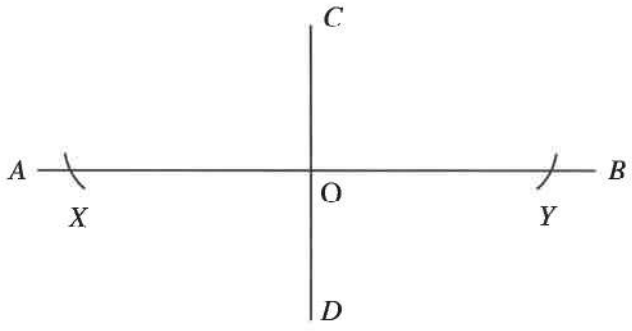
(1) A and B only.
(2) A and C only.
(3) B and C only.
(4) all A, B and C.

5. What is the method used to draw the following figure?



(1) Orthographic projection method
(2) Isometric projection method
(3) Perspective method
(4) Non standard method

6. In the following figure, $AO = OB$ and $CO = OD$.



Initially the lines and points are marked to construct an ellipse on it and the distance between points X and Y is

(1) length of major axis.
(2) length of minor axis.
(3) distance between two focuses.
(4) length of guide axis.

7. A simple instrument that can be used to obtain a measurement of a machine part and mark it on an another machine part during a mechanical technology activity is

(1) steel ruler. (2) jenny caliper. (3) divider. (4) tape.

8. What is the set of instrument that used to bend a rectangular groove shape along a straight line from thin soft steel sheet?

(1) Ball pene hammer, anvil stake
(2) Cross pene hammer, funnel stake
(3) Straight pene hammer, creasing stake
(4) Flat soft hammer, round bottom stake

[see page three

9. Producing goods using thin metal sheets is very common today. Which of the following to be considered as the main factor when selecting metal sheets for this purpose?
(1) Softness (2) Malleability (3) Plasticity (4) Unique colour

10. What is the most suitable hammer to level (flatten) a thin mild steel sheet?
(1) Ball pene hammer (2) Cross pene hammer
(3) Squared wooden mallet (4) Soft flat hammer

11. There are few unique properties for every metal. Among them, what are the most important properties for the technicians in most of the time?
(1) Physical properties (2) Chemical properties
(3) Thermal properties (4) Mechanical properties

12. Spark test is a popular method which used for the identification of metal. When a metal piece touch a rotating grinding wheel, it emitted sparks similar to paddy nuts and occasionally they were explored. What is this metal? Select from the metals given below.
(1) Bronze (2) Mild steel (3) Tool steel (4) Cast iron

13. Which gauge is meant by the SWG?
(1) Standard wire gauge (2) Birmingham gauge
(3) Feeler gauge (4) Standard sheet gauge

14. The tool that used to measure the external dimensions of a thin wire or a thin sheets more accurately is
(1) Outside caliper (2) Vernier caliper (3) Micrometer (4) Spring divider

15. Different types of hammers are used for technical tasks. What is the main factor that decides the 'size" of the hammer?
(1) Length of the handle (2) Weight of the hammer
(3) Surface shape of the hammer (4) Shape of the pene of the hammer

16. In which situation a feeler gauge can be used to take the measurements?
(1) Measuring the length of a work piece
(2) Measuring the width of a work piece
(3) Measuring the thickness of a work piece
(4) Measuring the space between two work pieces

17. Lubricating materials are applying between two work pieces in order of easy operationing and to minimize the wear. Select the self-lubricant metal among the following metals.
(1) Lead (2) Coper (3) Cast iron (4) Bronze

18. What is named as mould which used in casting industry?
(1) The tool used for compacting the casting soil
(2) The block prepared similar to the shape of the good to be produced
(3) The tool used to make the inlet for inserting liquid metal
(4) The tool used to damping casting soil

19. What is the metal used to produce the body parts of the equipment/machine which need to resist the vibration?
(1) Mild steel (2) Lead (3) Stainless steel (4) Cast iron

20. What is the name of the chemical reaction which produce heat and light?
(1) Producing heat (2) Providing substances for combustion
(3) Providing oxygen (4) Generating fire

21. The name of the continuous motion of an object around a circular path is known as
(1) linear motion. (2) reciprocating motion.
(3) rotational motion. (4) oscillatory motion.

[*see page four*

22. What is the metal used to produce the blade of the axed shape soldering iron that used for soft soldering?
(1) Brass (2) Copper (3) Bronze (4) Cast iron

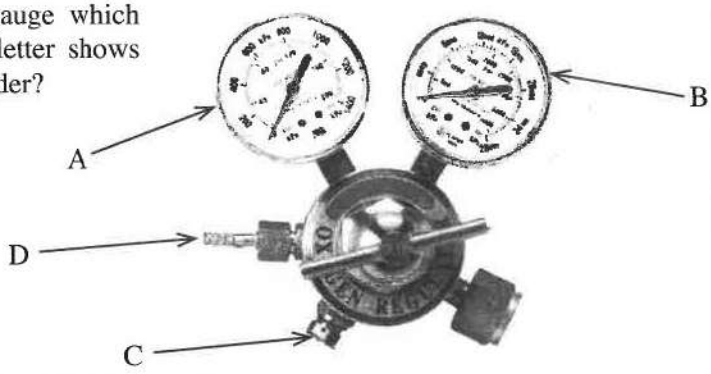
23. When there is a fire due to an error in electric cable connection or over heating the cables, what should a technician do at first is
(1) informing fire brigade unit.
(2) evacuate the place instantly.
(3) remove the valuable equipment from the place.
(4) disconnect the electricity supply of the relevant place.

24. What is the tool shown in following figure?

(1) Diamond point chisels
(2) Rivet punch
(3) Seaming tool
(4) Cross cut chisel

25. The figure shows an oxygen pressure gauge which is a component of gas welding. Which letter shows the pressure gauge of the oxygen cylinder?

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



26. Properties of the solution in design process is given under
(1) specifications. (2) production. (3) aesthetic. (4) human dynamic nature.

27. What is the characteristic that can be seen in a power transmission system that applied flat belt driven system?
(1) No maintenance required
(2) Power transmission for long distances is unsuccessful
(3) Not suitable to transmit heavy load of power
(4) Power transmission is unsuccessful when the diameters of two wheels are unequal

28. What is the task of air compressor of a power transmission system that applied compressed air?
(1) Cleaning of the air taken from environment to compress
(2) Taking the air from environment and compressing to the compress tank
(3) Controlling the pressure occurred when storing compressed air
(4) Releasing the unnecessary excess pressure in compressed tank

29. What is the proportion of mixing petrol and lubricant oil used for small two stroke engine when apply the petroil method?
(1) 10:1 (2) 12:1 (3) 15:1 (4) 25:1

30. A special advantage of a thermosyphon circulation system which used to cool the engine is
(1) no water pump. (2) using a big volume of water.
(3) using big hose pipes. (4) more suitable for residual engine.

31. It was observed that the fan belt of a motor car is oftenly break. What would be the reason for this defect?
(1) Using fan belts with wrong number
(2) Fan belt has been adjusted with low tension
(3) The pullies which connect the fan belt are not aligned
(4) The fan belt has been adjusted with high tension

[see page five

32. What is the gear that has the highest rotating power of a motor vehicle?
(1) First gear (2) Reverse gear (3) Second gear (4) Third gear

33. What is the task done by cooling fins in a air cooling engine?
(1) Limit the area that contact the air of the engine
(2) Increase the durability of the blower of the engine
(3) Reduce the efficiency of fuel of the engine
(4) Increase the area that contact the air of the engine

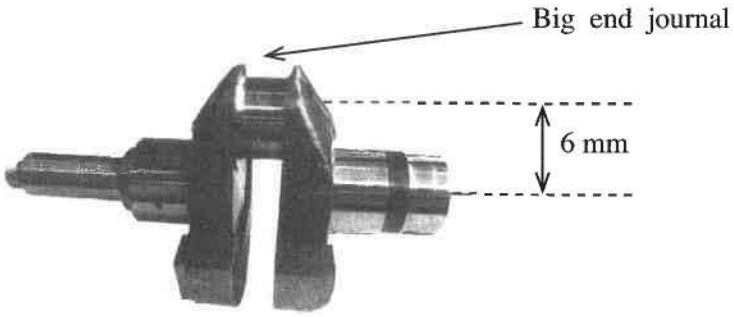
34. What is the component that directly contributing for the operation of signal lights of a motorbike?
(1) Flasher (2) Capacitor
(3) Relay (4) Regulator rectifier unit

35. What is the most suitable lubricating material to lubricate the drive chain of a motorbike?
(1) Grease (2) SAE 90 lubrication oil
(3) SAE 30 lubrication oil (4) SAE 140 lubrication oil

36. Parking light and break light of a motorbike are operated by two filaments in a one bulb. What are the efficiencies of these two filaments?
(1) 2 W, 7 W (2) 3 W, 12 W (3) 4 W, 17 W (4) 5 W, 21 W

37. What is the place where the temperature control valve is fixed to in the water cooling system of a modern motor vehicle engine?
(1) In between two water jackets of the engine blocks
(2) In between cylinder head and the top tank of the radiator
(3) In between water pump and engine block
(4) In between bottom tank of the radiator and engine body

38. The figure shows a crank shaft of a single cylinder engine.



What is the distance of linear motion of the engine piston according to the given measurements?
(1) 3 cm (2) 6 cm (3) 9 cm (4) 12 cm

39. There are three ways of frictions relevant on the moving parts of the machines in mechanical technology. From the friction controlling situations given below, select the situation that control the solid friction.
(1) Lubricating of drive chain of a motorbike
(2) Lubricating of the bearings of an engine crank shaft
(3) Lubricating the journals of an engine cam shaft
(4) Lubricating the engine parts in petroil method

40. The oil is supplied under a pressure to the relevant places from the sump in force feed lubrication system. This oil pressure is different at the different places of the engine. Which component area has the lowest lubrication oil pressure?
(1) Big end bearing and piston pins zone
(2) Main oil gallery and cylinder wall zone
(3) Valve assembly and rocker assembly zone
(4) Main bearing and cam shaft bearing zone

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

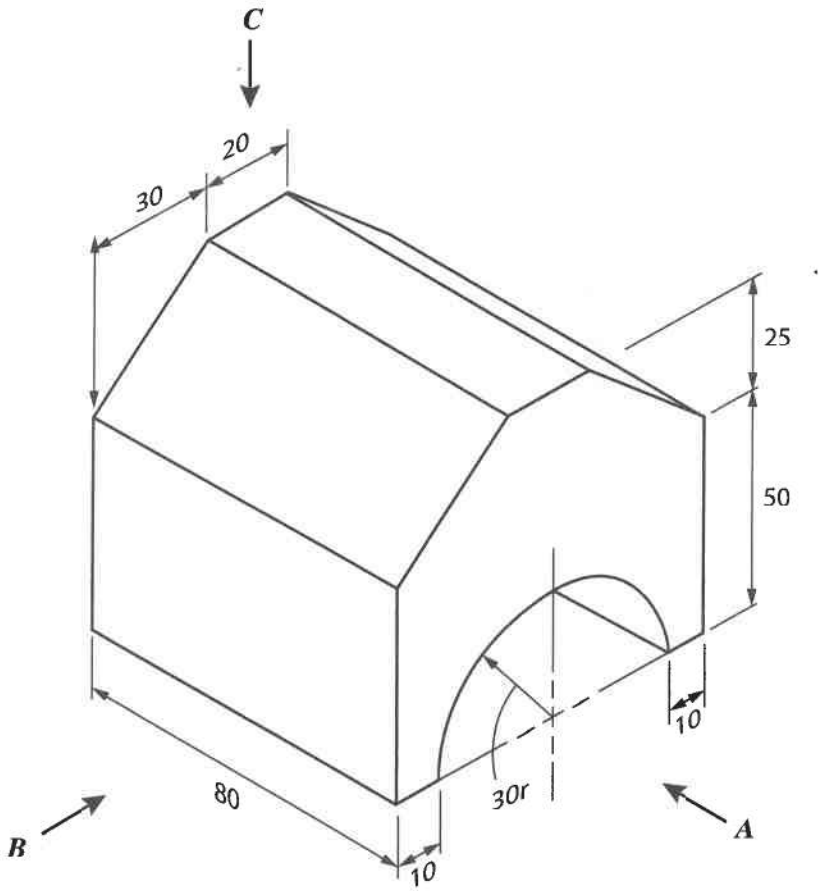
Design and Mechanical Technology II

* *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) Look at the isometric figure given below.

Draw following ***A***, ***B*** and ***C*** views according to the third angle method of orthographic projection principle in full scale as per given measurements.
(all measurement are in millimeters)

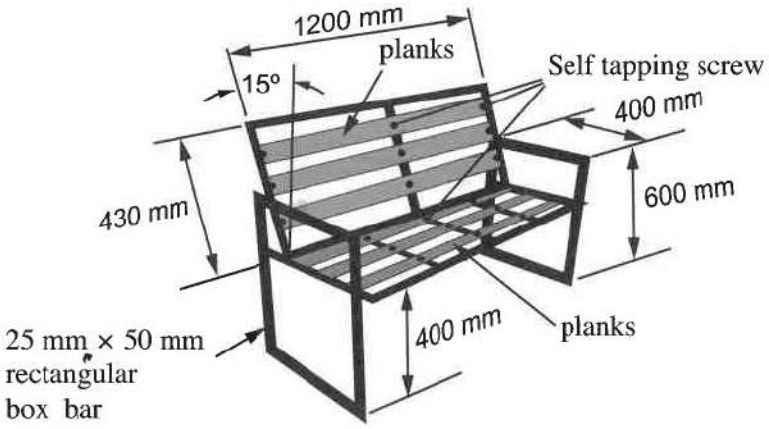
Front elevation from arrow ***A***
Side elevation from arrow ***B***
Plan from arrow ***C***



(ii) Draw a scalene triangle with your own measurement and construct the circumscribed circle of the triangle. Indicate the measurements you used in each side of the triangle.

[see page seven

2. It is decided to make an out door garden bench for the school's herbal park. The approved plan for this is given below.



The materials, tools and equipment required for making the bench are available at school technology unit. ie,

- 25 mm thick, 1200 mm length, 100 mm wide planks
- 25 mm × 50 mm cross section and 1230 mm length, 630 mm length, 460 mm length and 430 mm length mild steel rectangular box bars
- Self tapping screws 30 mm length
- Tools and equipment required for cutting, drilling and assembling
- Electric arc welding tools and equipment
- Finishing materials such as paint and brushes

(i) Describe the step by step process to be followed for making the bench with the tools and equipment applied for each tasks.

(ii) State the finishing tasks which can be followed for the durability of the bench.

(iii) State the sketches for your proposals/designs of the extra metal pipe connections for the given plan to enhance the strength of the bench.

3. The electricity for the electrical needs of a motor bike is achieving from a battery and a magneto.

(i) Draw and name the parts of a signal light circuit of a motorbike.

(ii) State **four** reasons that could cause to blown out the bulbs of a motorbike.

(iii) Describe, the inside arrangement of a 6 V lead acid battery using diagrams.

4. Safety precautions are the pre-preparation which need to practice before start the technical activities.

(i) Write **four** factors that are required to carry out a work site according to the safety precautions.

(ii) State **three** advantages of having adequate space in a factory.

(iii) State **four** features which should be included in a warning signal of a work site.

5. The support receiving from the usage of thin metal sheet to fulfil the human needs is a factor to be considered.

(i) State **four** reasons that cause to expand the production of goods using thin metal sheets.

(ii) Write **four** production industries with examples that used thin sheet metal.

(iii) Present the **four** categories of thin metal sheet with examples which can be classified according to the applied metal.

[*see page eight*

6. Production of goods by casting is an industry which has a long history.
   (i) Describe the wet sand casting method used to produce metal goods in casting.
   (ii) Write **four** advantages in producing goods by casting.
   (iii) Applying of finishing is essential for the products that are produced by casting. Explain the **four** types in finishing process.

7. The cooling system highly affects on the production of maximum power of the engines that use water cooling system.
   (i) Describe the method that used to produce hose pipes which used in water cooling system.
   (ii) To receive the required temperature to function the engine, will be delayed due to the errors of the water cooling system. State **three disadvantages** of this situation.
   (iii) Explain the operating method of vacuum valve of pressure cup fixed on radiator cap in a water cooling systems.

* * *