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නව නිර්දේශය/புதிய பாடத்திட்டம் / New Syllabus

NEW 89 E I, II
 Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2017 දෙසැම්බර්
 கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2017 டிசெம்பர்
General Certificate of Education (Ord. Level) Examination, December 2017

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

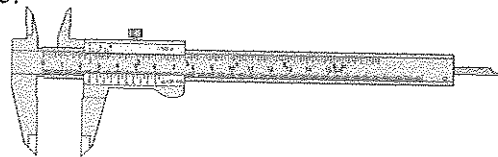
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 மூன்று மணித்தியாலம்
Three hours

Design and Mechanical Technology I

Note :

- Answer *all* questions.
- In each of the questions 1 to 40, pick one of the alternatives (1), (2), (3), (4) which you consider as *correct or most appropriate*.
- Mark a cross (X) 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.

- What is produced by using the blast furnace is
 (1) cast iron. (2) wrought iron. (3) white metal. (4) pig iron.
- What is the most suitable paint for painting a product made out of cast iron in finishing stage?
 (1) Enamel paint (2) Floor paint (3) Spray paint (4) Imulsion paint
- What is the 'non-ferrous' metal, out of following Metals?
 (1) Mild steel (2) Bronze (3) Cast iron (4) Tool steel
- At which level of the craftman's body are the jaws of the vice to be positioned, when the vice is to be fixed on the work bench for efficient work?
 (1) Heart level (2) Waist level (3) Elbow level (4) Shoulder level
- What are the other two materials that are mixed with iron ore, when melting iron ore for the production of pig iron?
 (1) Lime and coal (2) Lime and carbon
 (3) Silica sand and coal (4) Scrap iron and coal
- What is the first step you take, if you have seen a companion working with you struggling, having received an electric shock, when he is working with a power machine?
 (1) Remove the person from the place immediately
 (2) Provide first aid quickly
 (3) Switch off the power line
 (4) Shout for assistance
- Meaning of the safety in the workshop is to
 (1) avoid accidents by following workshop rules.
 (2) work avoiding incorrect use of tools and equipment.
 (3) work protecting tools and equipment and by following advices.
 (4) work protecting tools, materials, others and yourself.
- What is the measuring instrument shown in the figure?
 (1) Vernier caliper
 (2) Odd leg caliper
 (3) Outside caliper
 (4) Inside caliper
- What is the heat treatment method to be used to avoid wearing out a mechanical accessory made of mild steel?
 (1) Tempering (2) Annealing (3) Case hardening (4) Hardening



[see page two

10. When a hole is to be drilled on a metal surface using a drilling machine with a twist drill bit, the drill bit slipped back and forth, without starting at the point that hole to be drilled. The possible reason for this incident is

- (1) the tip of the drill bit being broken.
- (2) not having a centrepunch mark on the metal surface.
- (3) due to the soft nature of the metal surface.
- (4) the tip of the drill bit not sharpened to correct angle.

11. What is the most suitable method for storing tools and equipment that are used in technological workshop?

- (1) Keep in separate rooms in a box made of plank
- (2) Keep in a canvas bag with pockets
- (3) Keep in a box made of metal sheets that can be carried
- (4) Keep in a shadow board

12. Out of following tools, what is the main tool that can be used to prepare a sunk, narrow groove shape along a thin metal sheet?

- (1) Ball pane hammer
- (2) Cross pane hammer
- (3) Soft hammer
- (4) Claw hammer

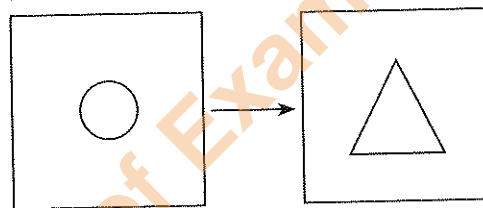
13. In the casting industry, products are manufactured, preparing a hole identical to the product to be made in the casting sand mould and filling it with casting material. What is the specific term used to identify this hole?

- (1) Drag
- (2) Mould box
- (3) Mould
- (4) Moulding pattern

14. What is the tool used to make the vertical pipe that is used to fill casting material when preparing the mould box to make a product by casting?

- (1) Risor
- (2) Runner
- (3) Swab
- (4) Gate

15. Figure below shows the first step and the final finished step of preparing an equilateral triangle shaped hole with 25 mm a side, at the centre of a 4 mm thick, 50 mm × 50 mm size mild steel sheet.



First step

Final finished

What are the tools used to do the above task?

- (1) Twist drill bit, flat file
- (2) Twist drill bit, half round file
- (3) Twist drill bit, square file
- (4) Twist drill bit, triangle file

16. What are the two metals that are mixed when preparing Brass metal?

- (1) Copper and lead
- (2) Copper and zinc
- (3) Copper and tin
- (4) Copper and bronze

17. What option indicates two instances of using 'thin lines' for the geometrical and mechanical drawing?

- (1) Dimension lines and construction lines
- (2) Centre lines and symmetrical lines
- (3) Sectional surface lines and dimension lines
- (4) Lines that show sectional planes and outlines

18. An object is drawn on the paper to a reduced size when it cannot be drawn to the true size. There is a measuring standard related to the 'representative fraction' published by a certain international organization to be followed in such occasions. What is the name of that organization?

- (1) International Mathematics Organization
- (2) Olympiad Organization
- (3) International Standard Organization
- (4) International Creators Organization

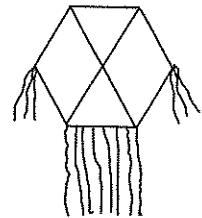
19. What is the equilateral polygon that is easiest to construct using only the 'compass' and the 'ruler' in the geometrical instrument box?

- (1) Equilateral heptagon
- (2) Equilateral pentagon
- (3) Equilateral octagon
- (4) Equilateral hexagon

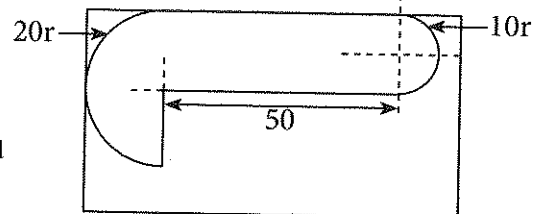
20. What is the geometrical shape that is indicated on the intersected surface, when a conical shaped solid object is intersected by a plane parallel to its axis?

- (1) Ellipse
- (2) Circle
- (3) Triangle
- (4) Parabola

21. What is the construction done first when constructing a tangent to the circle from an external point?
- (1) Join external point to the circumference.
 - (2) Join external point to the centre of the circle.
 - (3) Join centre point of the circle to the circumference.
 - (4) Draw a diameter to join the external point.
22. Two lengths are marked towards the same direction from the same point along the edge of the frame (of the paper strip) when constructing an ellipse by using the 'trammel method', when the length of the major and minor Axis are given. What are those two lengths?
- (1) Length of the major axis and the minor axis.
 - (2) Half of the length of the major axis and the minor axis.
 - (3) Half of the length of the major axis and half of the length of the minor axis.
 - (4) Length of the major axis and half of the length of the minor axis.
23. Tools and equipment related to the Design and Mechanical Technology subject are classified according to their uses. To which type does the poprivet machine belong?
- (1) Tools and equipment for cutting and chipping
 - (2) Tools and equipment for holding and clamping
 - (3) Tools and equipment for fixing and removing
 - (4) Tools and equipment for measuring, marking and testing
24. Figure shows an octagonal-shaped lantern of which the length of a side is 20 cm. It is made of mild steel wires that are 4 mm in diameter. What is the total length of the wires needed to make the frame?
- (1) 230 cm
 - (2) 380 cm
 - (3) 480 cm
 - (4) 530 cm



25. What is the option that includes the most suitable tools and equipment needed to prepare a workpiece that is marked on the 3 mm thick mild steel sheet as shown in the figure?



- (1) Scriber, divider, chisel, hacksaw and file
- (2) Scriber, divider, centrepunch, hacksaw and file
- (3) Scriber, pencil, snip, chisel and file
- (4) Scriber, spring divider, centrepunch, cross cut chisel and file

26. Electric arc welding method is widely used when products are made of metals. What is the metal that can be subjected to electric arc welding, out of below-mentioned metals?
- (1) Brass
 - (2) Mild steel
 - (3) Copper
 - (4) Aluminum

27. What is the temperature range needed for melting the cast iron?
- (1) 960 °C - 1050 °C
 - (2) 1060 °C - 1080 °C
 - (3) 1220 °C - 1280 °C
 - (4) 1510 °C - 1592 °C

28. Out of the following, for what task is the chipping hammer used?
- (1) For cleaning the welding surface well
 - (2) For leveling the welding surface
 - (3) For removing the fusion parts when welding is performed
 - (4) For correcting shortcomings when welding is performed

29. What is the expected result of inserting 'an idler wheel' between driving gear wheel and driven gear wheel when making a machine?
- (1) For rotating gear wheels at the opposite directions
 - (2) For rotating gear wheels at the same direction
 - (3) For changing the gear ratio
 - (4) For increasing power of driving wheel

30. What is the most appropriate statement regarding the position of the piston, when the spark is produced in spark plugs of a four stroke engine?
- (1) The spark is produced at the end of the compression stroke.
 - (2) The spark is produced at the start of the exhaust stroke.
 - (3) The spark is produced in the middle of the power stroke.
 - (4) The spark is produced at the end of the suction stroke.
31. It was felt that the vehicle was drawn to a side when applying brake in a vehicle with hydraulic breaks. A brake oil leak in the inside of a brake drum of one wheel could be observed. The possible reason for this situation could be
- (1) brake shoes being far away from the brake drum.
 - (2) loosening of the union nut of the pipe which provides brake oil.
 - (3) overfilling of brake oil to the brake system.
 - (4) damaged washer in the wheel cylinder.
32. What is the main task of the contact breaker of the ignition system of a motor bicycle?
- (1) Making the electricity in the ignition coil powerful.
 - (2) Disconnecting electricity in the secondary coil.
 - (3) Disconnecting the electricity received by the primary coil.
 - (4) Avoiding burning of electrode terminals of the spark plug.
33. What fluid should be added to the cells to correct the fluid level, when the fluid level (electrolyte) of the cells of the lead acid accumulator fixed in the motor vehicle is very low?
- (1) Sulfuric acid
 - (2) Distilled water
 - (3) Cooled water after boiling
 - (4) Sulfuric acid and water
34. What is the final task of the battery fixing process in a motor vehicle?
- (1) Fixing positive terminal
 - (2) Fixing negative terminal
 - (3) Fixing fuse
 - (4) Filling electrolyte
35. Applying 'radiator coolant' instead of water to the engine takes place widely in vehicles having water cooling system. Four statements related to the expected result of using this coolant are given below.
- A - minimum maintenance cost
 - B - avoiding rusting of the part of the cooling system
 - C - not requiring to test the water level of the radiator regularly
 - D - increasing the water boiling temperature beyond 100°C
- What are the correct statements, out of above?
- (1) A and C only.
 - (2) A and D only.
 - (3) B and C only.
 - (4) B and D only.
36. What is the option that indicates in order the motions of accessories; the rocker arm, the cam shaft and the piston when they are operating in the engine?
- (1) Oscillation, rotary and linear
 - (2) Rotary, oscillation and reciprocating
 - (3) Reciprocating, oscillation and rotary
 - (4) Oscillation, linear and rotary
37. Three terminals of a certain relay of a motor vehicle are named as H, B and S. What is the option that indicates the positions H, B, S terminals are to be joined respectively when this relay is fixed to the electric circuit of the vehicle?
- (1) Horn, horn switch, battery
 - (2) Horn switch, battery, horn
 - (3) Horn, battery, horn switch
 - (4) Battery, horn switch, horn
38. For what is overheating harmful to the engine?
- (1) Holes could be made in the hoses.
 - (2) Burning by exhaust boiling water vapor.
 - (3) burning 'gasket' of the engine.
 - (4) Weakening of the functions of the lubrication system.
39. Cooling fins have been fixed widely
- (1) below the 'sump' of the engine.
 - (2) around the thin tube of the radiator.
 - (3) close to the upper part of the engine body.
 - (4) close to the combustion chamber of the engine.
40. What is the National Vocational Qualification level given to the 'Technology Degree' certificate offered only by the University of Vocational Technologies (UNIVOTEC) situated at Ratmalana?
- (1) NVQ - 4
 - (2) NVQ - 5
 - (3) NVQ - 6
 - (4) NVQ - 7

නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

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	Department of Examinations, Sri Lanka	

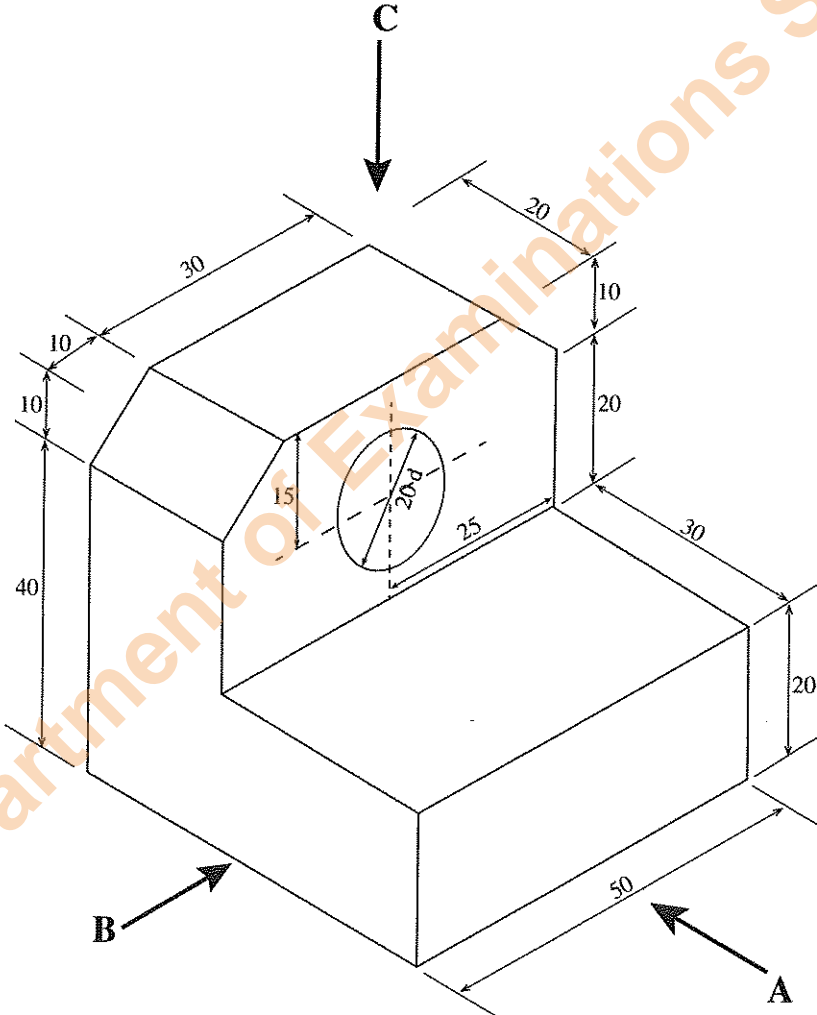
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கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2017 டிசெம்பர்
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வடிவமைப்பும் இயந்திரத் தொழினுட்பவியலும் I, II
Design and Mechanical Technology I, II

Design and Mechanical Technology II

* Answer five questions only selecting the first question and four others.

1. (i) Figure below shows an isometric view of an object.



(All dimensions are in millimetres.)

Using the above figure, draw.

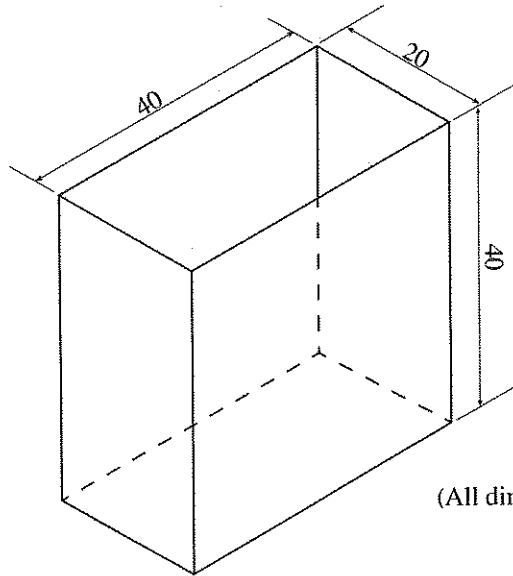
Front Elevation from the direction A

Side Elevation from the direction B

Plan from the direction C

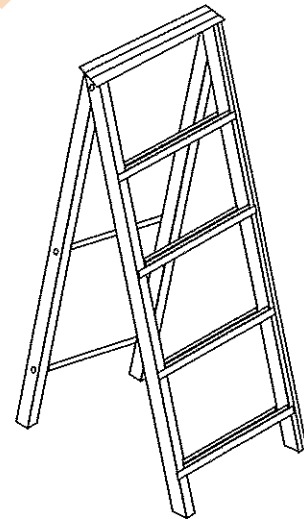
according to the third angle orthographic projection method (Use 1:1 scale).

- (ii) Draw the development of the box without the lid given in the figure below for making it with thin metal sheet with minimum welding joint length. Mark the folding lines with dotted lines in the development.



(All dimensions are in millimetres.)

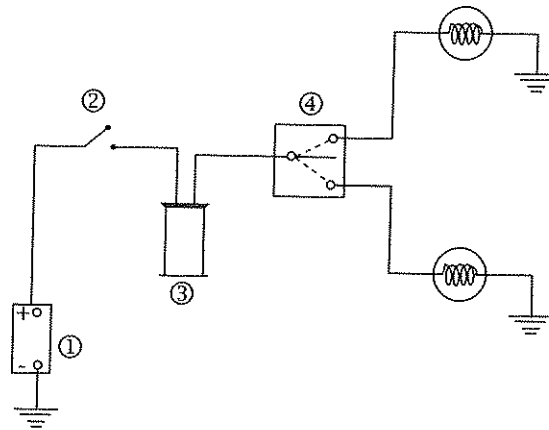
2. Producing goods by using aluminium metal are common today.
- Mention **two** advantages of producing goods by using aluminium metal.
 - Name **four** tools and equipment needed when producing the object in the given figure.
 - Write uses of the tools and equipment you named for the part (ii) above when producing this product.
 - Define 'Safety' and explain how you perform the task when producing the product given in the figure and the safety precautions you follow.



3. Casting is a widely used method to produce various goods.
- Name **three** methods of casting.
 - Mention **two** advantages and **two** disadvantages of using casting method to produce goods.
 - Name **three** accessories that have been produced by casting in a motor car engine.
 - Explain for what purpose the hand punner is needed in preparing mould box for casting.
4. The cooling system of the internal combustion engine performs an important task.
- Name **two** methods that are used in air cooling.
 - Write **one** instance for each method mentioned in (i) above.
 - Mention **two** advantages and **two** disadvantages in an engine with air cooling system compared to an engine with water cooling system.
 - Water boiling in the water cooling engine is harmful to the engine. Mention **four** facts that cause this situation.

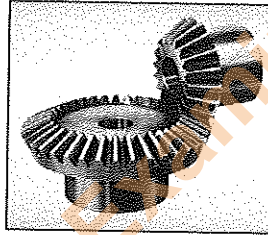
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5. Electrical system of the motor cycle performs a number of important tasks.



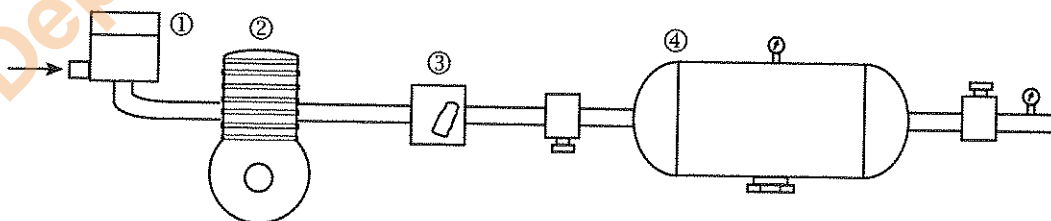
- (i) What is the electrical circuit shown in the above figure?
- (ii) Name the parts ①, ②, ③ and ④ in the circuit.
- (iii) Explain the task of the accessory no. ③.
- (iv) An indicator bulb is installed in the dash board for the driver to know the accurate operation of the circuit. Draw a circuit to show how the indicator bulb is connected to the circuit, based on the above circuit.

6. It is needed to transmit power generated by the prime mover to perform tasks at another place for the production of various machines.



- (i) State what the mechanical drive shown in the figure is.
- (ii) Name **two** occasions that the above drive method has been used to operate various machines and equipment.
- (iii) Write accessories in order, that contribute to transmit the power from engine to the final drive in a rear drive motor car.
- (iv) Write **four** advantages of lubricating the accessories mentioned in (iii) above and state lubricants that are used to lubricate each accessory.

7. In heavy vehicles, the force exerted by the foot of the driver to operate brakes is not adequate. To make this function easy, force of the compressed air, hydraulic pressure force and vacuum force are used.



- (i) State what power assisted method is used in the system shown in the figure.
- (ii) Name parts ①, ②, ③ and ④ in the above figure.
- (iii) State **two** advantages of using the method you mentioned in (i) above.
- (iv) State what compulsory maintenance work should be performed in this system and write **two** other instances where these power assisted devices are used other than in brake system.

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