EXAMINATIONS COUNCIL OF ESWATINI

JC

EXAMINATION REPORT

FOR

DESIGN AND TECHNOLOGY

YEAR

2023

PAPER 537/01

General Comments

In 2023 there were one thousand six hundred and seventy nine (1679) candidates who sat for the Design and Technology Paper 1, this indicates a slight decline from the number of candidates who sat for this paper in 2022. However, the general performance was slightly above than that of the previous year. Candidates were required to answer all questions in **Section B** for the second time running. It was observed even this year that candidates were able to finish the paper on time. In general candidates performed much better in **Section A** than in **Section B**, and as it has always been the case in previous years, most candidates performed better in **B3** than in **B1** and **B2**.

Section A

This section consisted of twenty questions (17) worth 40 marks. These were questions that required short answers. The questions were from the different components of the syllabus: Resistant Materials (RM), Graphics (GP) and Systems and Control (SC). This section was assessing the following objectives; knowledge and understanding, problem solving, communication and realization.

Comments on Specific Questions

SECTION A

Question 1

For this question candidates were given a 3D drawing of a step block.

The expected response was **oblique projection.** A majority of candidates were able to give the correct response. There were few however, who gave deviating responses. One of the deviating responses were, isometric, orthographic, first angle projection, and these were not accepted leading to the loss of 1 mark.

Question 2

Candidates were given part of a joint marked out on a piece of wood.

(a) Candidates were asked to name a tool used to mark parallel lines along the grains.

The expected response was **mortice gauge**. A fair number of candidature were able to give the expected response to the question. A significant number of the candidature were giving responses such as marking gauge, try square, scriber etc., and these were not accepted by the examiners.

(b) Candidates were asked to name the specific tool that can be used to remove the waste.

The expected response was **mortice chisel**. It was only a small fraction of the total candidature that was able to give the correct response to this question. A lot of candidates gave an incomplete answer, such as chisel, unfortunately these was not accepted.

Question 3

For this question candidates were given a straight line XY to be divided into a ratio 3:2:5.

Candidates were expected to project lines at point 3 and 5 to the line to complete the ratio, the lines were to be parallel line 10 – y. Only a few number of candidate were able to draw parallel lines correctly, other candidate divided lie XY into equal parts, others the lines were not parallel to line 10-y, and these were not awarded marks.

Question 4

Candidates were given an orthographic projection of a solid object. They were to circle the correct isometric drawing that represent the drawn orthographic projection views.

The expected response was **A**. A fair number of candidates were able to give the correct response. There were those however, that gave response such as B unfortunately these could not attain the mark set aside for this question.

Question 5

Candidates were asked to explain why it is important to use a marking knife where there will be a saw cut on wood.

The expected response was **for accurate marking the pieces to prevent tearing of the grain**.Only a few number of candidate managed to give the correct response to the question, others gave deviating responses which were obviously not accepted.

Question 6

For this question candidates were given a drawing of two pieces of 4mm mild steel. They were required to name one temporary method that can be used to join the two pieces together.

The expected response was **bolt and nut**. A larger fraction of the total candidature was able to give the expected response to this question. Only a few number of candidates gave dissenting responses such screws, nails, welding, gluing etc., and these were not awarded with the mark designated for this question.

Question 7

For this question candidates were given the drawing of two classes of levers. Candidates were required to name the two classes of levers labeled A and B.

A. The expected response was **Class 1.** A majority of candidates were able to give the expected response, other candidates gave dissenting responses such third class, second class and these responses could not be awarded with the one (1) mark designated for this question.

B. The expected response was **class 2.**Again a majority of candidate were able to give the correct response, others gave responses such as first class and third class, and these were not accepted.

Question 8

For this question candidates were given the drawing representing a small structure.Candidates was required to identify and name a redundant structural member.

The expected responses were **AF**. Only a fair number of candidates was able to give the expected response; others were giving different responses such DB, EB, F only, and unfortunately this could not be awarded with the mark

Question 9

Candidates were given a drawing of two pieces of wood to be joined by an angle bridle joint. Candidates were then requested to show the marking out of the joint on the two members.

The expected response was **marking double lines on both pieces using mortice gauge and shade the waste correctly.** Very few candidates were able to give the expected response. A lot of candidates showed making of dowel joint others a barefaced angle joint, unfortunately such response these could not attain the one (1) allocated to this question.

Question 10

Candidates were given a table showing a classification of wood. Candidates were required to complete the table by writing the specific name of the wood.

The expected response was **South African Pine** for Softwood **and Saligna or Meranti** for Hardwood This question was well done; a majority of candidates were able to give the correct and expected response. There were very few that gave dissenting responses such as MDF Plywood for softwood and South African Pine for hardwood.

Question 11

For this question candidates were required to explain the difference between thermoplastic and thermosetting plastics.

The expected response was that thermoplastics can be reheated, bent into different shapes many tines whereas thermosetting plastics become permanently hard after being heated**.** Only a small number of candidates were able to give the correct response. A majority of other candidates gave varying responses such as thermosetting, wet plastic, others simple left the question without an attempt.

Question 12

Candidates were given an image of a centre gauge. They were then given another incomplete graphical representation of the centre gauge. They were requested to complete the drawing by constructing the tangential line from point P to the circular part.

The expectation was that candidates would demonstrate the skill of constructing a tangent from a point outside a circle. They were to join the centre to P, bisect the line, draw semi circle and draw the tangent. This question proved to be a challenge to many candidates as they failed to construct the expected tangent. Some candidate only drew a line without the proper construction and this led to a loss of marks.

Question 13

For this question candidates were given an image of a plastic fitting used in plumbing.

(a) Candidates were then asked to name the type used to make the fitting. The expected response was **P.V.C.** There were very few numbers of candidates who were able to give the expected response. Many were giving dissenting responses such as ABS, PVA, Thermoplastics, thermosetting plastic**,** and these could not be awarded with the one (1) mark set aside for this question.

(b) Candidates were to state the properties of plastics that make it suitable for the fittings. The expected responses were **resistant to corrosion, stiff, easy to extrude**. There were few numbers of candidates who were able to give the expected response. A majority of candidates gave responses such as flexible, strong, and can be reformed and unfortunately this could not be awarded with the mark.

Question 14

For this question candidates were presented with an image showing a pot used in a home kitchen.

(a) Candidates were asked to name a suitable material to be used for the manufacture of such a product.

The expected response was either **aluminium or stainless steel**. Candidates 'performance on this question was superb. Very few were giving deviating responses such as mild steel, copper metal etc., and these were not accepted.

(b) Candidates were required to give one reason why the material in (a) is used.

The expected responses were **resistant to corrosion, good conductor of heat and light in weight**. Many candidates were able to give the expected response. A few number of candidates gave responses such as can resist heat, cannot be affected by heat and these were not accepted.

Question 15

Candidates were given a drawing of three pieces of pine joined edge to edge to make a wider surface in table tops.

(a) Candidates were required to name one type of glue suitable for joining the three pieces together.

The expected response was either **P.V.A or Animal glue**. There were very few numbers of candidates who were able to give the expected response. Many were giving dissenting responses such as P.V.C, cold glue, wood glue, etc**.,** these were not accepted.

(b) For this question candidates were required to show three sash cramps could be arranged to hold the pieces of pine together while the glue sets.

Candidates were expected to sketch at **least three sash cramps, with the one in middle facing the opposite direction**. The performance on this question was disastrous, only a few numbers

of candidates were able to give the expected response. A majority of candidates made sketches of three sash cramp on one side, of G-cramps and others simple left the question unanswered.

Question 16

(a) For this question candidates were given two images of gear systems. They were then asked to name each gear system.

A. The expected response was **worm and worm wheel gear**. The performance by candidates in this question was excellent a majority of candidates were able to give the expected response. Very few gave different responses from what was expected, responses such as rack and pinion, idler gear etc.

B The expected response was **bevel gear**. The response on this question by candidate was superb. There were few number of candidates who gave responses such as snail gear, worm gear etc: were not accepted.

(b) For this question candidates were required to give one example where each gear system can be used.

A. The expected responses were **electric food mixer, guitar tuner, and gear box**. A bigger majority of candidates was able to give the expected response. it was only a few who gave dissenting responses. Some of the dissenting responses were a car, reducing speed, bicycles etc., and unfortunately they not awarded with the mark allocated to this question.

B The expected response were **hand drill, chuck key, remote electric gate**, etc: Many candidates were able to give the expected response, the performance of candidates on this question was superb. Very few were giving deviating responses such as driller, machines etc., and these were not accepted.

Question 17

Candidates were given a sketch representing a boundary of a piece of land where the owner intends building a hexagonal structure.

(a) Candidates were asked to name shape ABCD.

The expected response was **trapezium**. A majority of candidates were able to give the expected response, many were giving varying responses such as trapezoid, parallelogram, quadrilateral etc., and these could not be awarded with the one (1) mark set aside for this question.

(b) For this question candidates were required to use geometrical construction to draw a regular hexagon with side **XY** to be part of the hexagonal structure. The expected response was to use a compass to construct the hexagon. There were very few candidates that were able to construct the regular hexagon showing all the steps to achieve the intended outcome. A greater fraction of the candidature drew a pentagon, heptagon and drew the hexagon without proper construction and this resulted in a great loss of marks.

SECTION B

This section comprised of three (3) structured questions (**B1**, **B2** and **B3**) based on Graphic Products, Resistant Materials and Systems and Control. Candidates had to answer all questions. Each question was worth twenty marks (20) making the total of this section to be sixty (60) marks.

B1 – Graphic Products

Question 1

Candidates were given a solid geometry objects. They were then required to state the correct names of the objects.

A. The expected response was **cylinde**r. This question was well answered as a majority of the candidates were able to give expected response. There were very few candidates that deviated from expected response and those were giving responses such as cone, circular object, etc., and obviously lost the (1) mark

B The expected response was a **triangular based pyramid.** This question was fairly done as almost half of the candidates were able to come up the expected response. The other half of the total candidature gave dissenting responses such as pyramid, triangular prism etc: and these were not accepted.

Question 2

Candidates were given an isometric drawing of a bracket reinforced by a web, a cutting plane running along the web and two orthographic views projection is also shown.

Candidates were required to complete sectional front X-Y.

The expectation was that candidates would section the front correctly leaving the web without hatching to show that it is not be sectioned. They were also expected to use correct angle and section lines to be evenly spaced. A fair number of candidates were able to get maximum points on this question. Other candidates could not section the front as result they came up with many responses such as adding the end view sectioning the plan which were not accepted.

Question 3

For this question candidates were required to name materials used for modeling products.

The expected responses were **paper card, plastic, hardboard, Styrofoam, plywood**, etc; a majority of candidates were able to give the correct response for the question. There are some however, that gave varying responses such as wood, scrap pieces, contact glue, paper glue and these were not accepted.

Question 4

For this question candidates were given a drawing in isometric projection and were required to draw using the two-point perspective drawing of the block with corner X as the front.

Candidates were expected to draw the block full size using two points perspective drawing**.** Very few candidates were able to collect the maximum marks. Others produced different projections such as isometric projection, oblique projection as well as inaccurate drawing however these were not accepted.

Question 5

Candidates were given line AB representing one side of an equilateral triangular plot and were required to use geometrical constructions to complete the triangle.

Candidates were expected to use a compass to draw two arcs meeting at C using AB as radius, A and B as centres. This appeared to be a well answered question since a majority of candidates were able to give the expected response. Nevertheless, there were some candidates that constructed an isosceles triangle, scalene triangle and this led to loss of marks.

Question 6

For this question candidates were given a visual of a water bottle used by athletes and were required to use geometrical construction to enlarge the water bottle to a ratio 1:2.

The expected response was an accurately enlarged water bottle. To attain the maximum of 5 marks candidates where expected to divide the base of the bottle into 2 equal parts, draw at least 3 radial lines, draw parallel lines to meet the dial lines bottle. A majority of candidates seemed to encounter challenges when attempting this question as many managed to attain 1 mark from the evident of bottle profile.

B2 – Resistant Materials

Question 1

This question required candidates to state two safety rules which should always be followed when using a chisel.

The expected responses were both hands behind the cutting edge, never use a blunt chisel, and never test the bland using the finger. A fair number of candidates was able to give the expected response. There were some candidates who gave responses such as never enter the workshop without the teacher's permission, do not play with tools, which were not accepted.

Question 2

For this question candidates were required to name any two elements of a design brief.

The expected response was to state any two of this elements **user, intention, location, and function.** A fair number of candidates was able to give the expected response. There were some candidates, however, who gave responses such as situation, problem, specification, design need and these responses could not be awarded the mark.

Question 3

Candidates were given a visual of a piece of MDF that need to have a circular hole cut out of it.

(a) Candidates were required to name a tool that could be used to mark the circular hole.

The expected response was **wing compass.** A majority of candidates were able to give the expected response. Others gave many different answers such pencil, calipers etc., and these responses could not be awarded with the one mark available for the question.

(b) Candidates were asked to explain how the waste marked at A could be removed and finished.

The expected response was list the stages in order starting from drilling a hole, use a compass, pad, coping, jig saw to cut circular shape, and clean waste with a round file. A great number of candidates were able to give the expected responses, a substantial fraction of the candidates were able to state drilling as the first stage. However some candidate gave response such as use a chisel, sanding paper, varnish etc: these were not accepted.

Question 4

For this question candidates were given a partly exploded pencil holder made of plastic and wood.

(a) Candidates were required to name one suitable type of plastic that could be used for making the pencil holder.

The expected response was **acrylic plastic**. A good number of candidates were able to give this response. Other candidates were giving many different responses which were not required for this question, responses such thermoplastic, thermosetting plastic P.V.C etc,, and these could not be awarded with 1 marks allocated for this question.

(b) This question asked candidates to state an appropriate adhesive for joining the plastic at A.

The expected response was **tensol cement**. Most candidates responded well to this question. However some candidates gave responses such P.V.A, plastic glue, contact glue and this were not awarded marks.

(c) This question required to candidates were explain the process of producing the bend at B.

The expectation was that candidates would demonstrate the working knowledge of bending plastic and to identify the stages, the sequences was, mark the area to be bent, apply heat using a strip heater, and use a bending former to hold acrylic plastic whilst being bent. A majority of candidates were not able explain the bending process of acrylic plastic. The deviating responses were vacuum forming, press forming, heating plastic with fire etc: which were unfortunately not accepted.

(d) This question required candidates to explain how the plastic part of the holder can be joined to the wooden base using fasteners.

Candidates were expected to demonstrate knowledge how join plastic to wooden base. The expectation was that candidate would identify the following stages, drilling holes, insert screws to secure the plastic or use pop rivets. A fair number of candidates were able to give the expected response. There were some candidates who gave differing responses such as using bolt and nuts, apply glue, nailing joining plastic to wooden base and these were not awarded with marks.

Question 5

Candidates were given a visual of a piece of 5mm thick mild steel.

(a) This question required candidates to name the tools used for marking: radius A.

The expected response was **spring divider**. This question was well attempted as a number of candidates were able to give the expected response. A small number of candidates gave responses such as wing compass; compass and this were not accepted.

The centre for the hole C before drilling.

The expected response was **centre punch.** This question was well answered as a majority of candidate was able to give the expected response. There were candidates however, who gave differing responses such dot punch and such candidate were not awarded with marks.

(b) This question required candidates to name specific type of files used to shape:

Radius A: The expected response was **half round file**. A fair number of the total candidature was able to give the expected response. The other fraction gave dissenting responses such as round file, circular file and others which were not welcome for this question.

Corner B: the expected response was **hand file**. Many candidates performed poorly in this question. Some candidates were giving responses such as flat file, square file etc. and all these were not accepted by the examiners.

(c) This question required candidates to explain why it is dangerous to us a file without a handle.

The expected response was **tang can cause injury**. This question was well answered, a majority of the candidates were able to give expected response There were some though who missed it and gave responses such damage the work piece, file yourself, etc., and these responses could not be awarded the mark.

B3 – Systems and Control

Question 1

For this question candidates were given an image of a part of a rotary clothes hanger.

(a) Candidates were required to name the force that will be applied to the parts labeled X, Y and Z of the structure when the rotary clothes drier is in use.

Part X: The expected response was; **compression, bending, torsion.** A majority of the candidates were able to give the expected response, however a small fraction of the candidates encountered some problems as they gave many different responses such as effort, fulcrum, load, gravitational force which were not awarded with a mark as it cannot be accepted.

Part Y: The expected response was **shear or torsion**. The general performance of candidates was fair on this particular question. Some candidates though came up with deviating responses such as bending, which was not accepted.

Part Z: The expected response was **tension or bending.** A majority of candidates gave the expected response. However, there were was small fraction of the candidates who gave responses such compression, force of gravity.

Question 2

Candidates were asked to name a mechanism that converts rotary movement to reciprocating movement.

The expected response was; **cam and follower crank and slider, bell crank.** This question was fairly done, as reasonable amount of candidates were able to give the expected response. Some candidates gave varying responses such as belt and pulley, cam, linkage, etc., and unfortunately these responses could not be rewarded.

Question 3

Candidates were given a visual showing a bracket made from a square steel tube.

(a) Candidates were asked to sketch member to show how the welded joint could be reinforced.

The expected response was **sketch of a strut or tie.** This question was well answered as a majority of the candidates were to give a positive response. There were fewer candidates who gave dissenting responses such as drawing welding tools, and this response could not be rewarded.

(b) Candidates were asked to name the method of reinforcing the bracket.

The expected response was **triangulation.** A majority of candidate were able to give the expected response. There were those however, who could not. They came up with responses such as welding, soldering, and screwing; these were not awarded with 1 mark for this question.

Question 4

For this question candidates were given visual of three pulley systems.

(a) This question required candidates to complete the table to describe the motion transmission for each pulley system.

The expected response for A was **clockwise**, B was **anticlockwise** and **speed increase**, C input was **clockwise and speed decrease**. A majority of candidate was able to complete the table correctly and gave expected response. It was only a minority of candidates that gave responses such as input or output which were not accepted.

(b) This question required candidates to describe one advantage that sprocket and chain mechanism have over belt and pulley.

The expected response was that **does not slip**. A majority of was able to give the expected response. Only a few candidate gave deviating responses such as strong, does not tear etc, and this resulted in the loss of line 2 marks allocated to this question.

(c) This question required candidates to give an example where a chain and sprocket mechanism is used.

The expected response was a **bicycle, bikes; hydraulic lifts tracks** etc. a majority of candidates were able to give the expected response.

Question 5

Candidates were given a picture of a model plane.

(a) Candidates were asked to label a strut and a shell structure.

Candidates were expected to label members supporting the wings for strut and the body of the plane for shell. Even though a greater number of candidate correctly label the strut and shell, there were instances where some did not respond to the question left unanswered.

(b) Candidates were given an image of the wings of the plane made from ribs and spars.

This question required candidate to state the name for this type of structure.

The expected response was **frame structure**. A significant number of candidates were able to give the expected response. There were candidate who gave differing responses such as shell structure, manmade structure and any others which were however not awarded with the 1 mark allocated to this question.

(c) This question required candidates to name the force resisted by a strut.

The expected response was **compression force**. A majority of candidates were able to get this question right. However, there were those that came up with other responses such as tension, torsion and were not accepted.

(d) This question required candidates to name the force resisted by a tie.

The expected response was **tension**. A majority of candidates were able to give the expected response. Some candidates were giving responses such as compression, bending etc, which were not awarded a mark.

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COURSEWORK

One hundred and two (102) centres registered candidates for the coursework. Of the centres, one thousand six hundred and seventy nine (1679) were registered but one thousand six hundred and fourteen (1614) submitted work for this year's examination. This number indicates a decrease when compared to the number of candidates who registered for the examination in the year of 2022. Sixty five (65) candidates did not submit their coursework.

The coursework for Junior Certificate is similar to EGCSE in that it is a school based component of the syllabus that is compulsory to all candidates registered for Design and Technology. Each candidate undertakes a personally identified project centred on the chosen prescribed theme **(BETTER LIVING).** The coursework is expected to be done over the final two terms of the year. Candidates' folders are then presented for marking.

GENERAL PRESENTATION AND RECOMMENDATIONS

Generally the performance indicated an improvement in most centres .There was great improvement on sketches though there were those centres where candidates were poor in sketching .In some centres most of the work was presented on dirty booklets. In some, pages were glued to each other due to untidiness in the pasting of pictures. There were some candidates that did not fill in the information well on the cover page. Some candidates had missing information, for example candidate number and theme. Some candidates still used a pencil to write in the booklet yet the instruction was clear that they should write in blue or black pen.

REALIZATION ASSESSMENT FORM

This year a product realization assessment form was sent to centres for the assessment of product/artefact. Candidates were required to produce an artefact or product. The artefact carried 30 marks. There were a lot of problems with this form in that some candidates had marks allocated to them yet there were no supporting evidence of pictures to show that the product was indeed constructed. A few had pictures showing that the product was made and yet there were no marks allocated to candidates on the part of realization.

COMMENTS ON INDIVIDUAL ASSESSMENT OBJECTIVES

Theme analysis

This objective was well done by most candidates .They defined the theme by providing two or more definitions which is highly commendable. Few candidates did not indicated the area of interest .Some candidates produced less than three links from general areas. As a result marks were lost by such candidates.

Identification of need

Almost all centres completed this objective well. Centre assessment of this objective was reasonably accurate, although the design brief of some few candidates lacked one or two of the five elements (location, user, intention, function and need).

Research into design brief resulting in specifications

Candidates demonstrated an excellent understanding of the requirement of this objectives. Most were able to present existing ideas that were of a wide range .Evaluation of existing ideas was well done by most candidates .However the conclusion of the research on existing ideas was poorly attended by most candidates. In this part candidates are expected to make a summary of their research on the existing ideas .Candidates are expected to comment on existing ideas in terms of construction, material, joints, colors, forms, etc. Most candidates included design specifications in their research, although in some candidates it was less specific .Of all specifications that candidates can write, they are expected to give only five including function. Functions still remain the most important specification that learners should include. However a few did not include function and this resulted in the loss of marks.

Generation of ideas

There was general improvement of quality in this objective. Many candidates produced varying sketches i.e. concepts of wide range. A lot of them demonstrated excellent creativity and good annotation which is highly commendable. However there were those who copied and reproduced the existing ideas as their own concepts and this resulted in the loss of marks. Candidates used common methods of drawing techniques, including two dimensional and pictorial effectively. The evaluation matrix still remains as one problematic part of this assessment. While most candidates did well in filling in the design specification sub topic in the first column the second column remained problematic. In the second column candidates are expected to write evaluation notes for each idea against each specification. However a lot of candidates did note write the evaluation notes but opted to rewrite the specifications, which resulted in the loss of marks. The third column was well done by most candidates. However a lot of candidates did not produce a key for the evaluation matrix and as such lost some marks. Almost all candidates were able to state the chosen idea but many were unable to properly justify the selection. In this part candidates are expected to justify the selection of chosen idea using specifications.

Development of proposed solution

This objective was a challenge to most candidates even this year. Most candidates were drawing exploded views and showing constructional details instead of showing details that clearly indicate suggested changes to improve the chosen idea and justify the changes. Most candidates did produce mock-ups, however, some candidates lost marks because they did not test their mock-ups. Pictures of the mock-ups are to be pasted as evidence that indeed the mock-up was constructed, however some candidates pasted pictures of the product in this section which resulted in the loss of marks. Candidates are advised to draw and render the final idea with all justified changes included.

Planning for production

There was general improvement in this section for most candidates. Most candidates produced good clear working drawing with good line quality. Some candidates did not state the scale of drawing and that resulted in the loss of marks. Most candidates were generally good on the cutting list and planning for production.

Product realization

The level of performance in general was quite good in this objective. Most candidates produced the artefact/product which was impressive. Candidates should be encouraged to produce artefact of good standard and quality.

Testing and evaluation

This section was also problematic in that candidates performed poorly. Most candidates tested their artefacts/products but a lot of them tested without objectivity. Products were not tested in the correct environment of operation as a result marks were lost. Evaluation of product should also be done in reference to design specifications. Many candidates simply transferred the specification to this section without any element of evaluation and this resulted in the loss of marks. In this section candidates are also required to state future modifications and justify their modifications. Candidates should be encouraged to suggest modifications relevant to the product. In addition, such suggestions should seek to improve the product.