EXAMINATIONS COUNCIL OF ESWATINI

JC

EXAMINATION REPORT

FOR

DESIGN AND TECHNOLOGY

YEAR

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JC Design and Technology

Paper 537/01

General Comments

The level of performance was slightly lower than the previous years. For the first time in 2021 candidates were required to answer all questions in Section B, yet in the previous years they had to answer all only two questions. For the first time the paper was marked out 100, yet in the previous years it had been marked out 70 marks. An observation was made to the effect that candidates managed to finish the paper. In general candidates performed much better in Section B than in Section A, especially Question B2 and Question B3. Question B1 seemed to be a bit of challenge to most candidates. Some individual centres performed so poorly, their candidates would leave many questions unanswered, while some centres performed so well with only a few exceptions here and there of course.

SECTION A

This section consisted of twenty questions (20) 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 realisation.

Comments on Specific Questions

Question 1

For this question candidates were presented with a cube that was drawn in pictorial view. They were asked to name the type of projection used in the presentation of the cube.

The expected response was **two-point perspective** or **double point perspective**. This question was not well done as most of the candidates were unable to give expected response. Some candidates were giving responses such as perspective, isometric, oblique etc., which were unable to attain the 1 mark allocated for this question.

Question 2

Candidates were given an image of a method of seasoning timber.

(a) Candidates were asked to give one reason for seasoning timber.

The expected response was one of the following; prevent fungi attack, make it stable in use, prevent decay, make it easy to work it, reduce weight. A majority of candidates were able to give the expected response. There were some though few that gave dissenting responses such as to remove moisture, to make it strong and others. These were not awarded the mark.

(b) Candidates were asked to give the purpose of the wood strips that were labelled A on the image.

The expected response was that the strip separates the boards for air circulation. This question proved to be a challenge to most candidates. Very few were able to give the expected response.

Question 3

For this question candidates were given a sketch of a gear train. Candidates were then asked to indicate by means of an arrow the direction of gear C.

The expected response was a **clockwise arrow** placed next to gear **C** to indicate the direction of the rotation. A bigger share of the total candidature was able give the arrow indicating the correct direction. Very few candidates gave an anti-clockwise arrow which was not accepted in this instance.

Question 4

Candidates were given a sketch of a staple remover. They were then asked to name the class in which the staple remover belong.

The expected response was **Class 3** or **3rd Class**. A fair number of candidates were able to give the correct response. There were those however, that gave responses such as 1st class, or 2nd class unfortunately these were not awarded marks.

Question 5

Candidates were given an isometric drawing and an incomplete orthographic drawing of a bracket. They were then required to complete the orthographic projection.

The expected response was hatching lines that that do not run over the two holes. Candidates were also expected to include centre lines. This question proved to be a great challenge as there were very few candidates from a few centres that were able to get this question correct. Some candidates left the question unattended, a lot of candidates did not include the centre line and ended up losing the mark designated for that.

Question 6

For this question candidates were required to state the difference between a centre punch and a dot punch.

The expected response was that a centre punch has an angle of 90^0 while a dot punch has an angle of 60^0 and also that a centre punch is for marking centres whilst a dot punch is for marking a witness line. A majority of candidates had a challenge giving the expected response. Some candidates were confusing the angles for the two tools.

Question 7

For this question candidates were given a twisted belt and pulley mechanism.

(a) Candidates were required to give a reason why Part A of the mechanism was twisted.

The expected response was that; **to make a reverse motion** or **to allow pulleys to rotate in opposite directions.** Only a fair number of candidates were able to give the expected response, other candidates gave dissenting responses and as result they could not be awarded the one (1) mark.

(b) Candidates were presented with a graphical presentation of pulleys which were part B and part C in the mechanism. They were then asked to construct on tangent.

As this was a graphical question candidates were expected to apply Graphic Products knowledge and skills. There were expected to bisect the centre line, then construct a semi-circle and from here they were expected to add the radii of the two circles, then draw an arc of the new radius which would cut the semi-circle that had been already drawn. At this point they were expected to draw a normal from centre of the larger circle to where the arc cuts the circle. Thereafter candidates were expected to draw another normal from the smaller circle parallel to the first one but going in the opposite direction. Lastly candidates were expected to draw an internal tangent to the two circles with normal as point of contact. This question proved to be a challenge to most of the candidates. Very few were able to attain full marks. Most candidates that attempted this question were bisected the centre line and draw the semi-circle, they would then draw the tangent without geometrical construction and this resulted in the loss of marks.

Question 8

For this question candidates were presented with an image of a sauce pan. They were asked to give two reasons why aluminium is suitable for making the saucepan.

Candidates were expected to give any two of the responses; aluminium does not rust, non-corrosive, good conductor of heat, light in weight, non-toxic and high melting point. A majority of candidates were able to give the expected responses only a few were giving different responses such good conductor of electricity. In as much it is a property of aluminium but in this instance it was not suitable and no marks were awarded for such a response.

Question 9

Candidates were given an image of a file.

(a) Candidates were required to give the correct name of the file.

The expected response was **hand file.** Only a handful of candidates were able to give the correct response to the question. Others were giving responses such as flat file, safe file etc. and these were not awarded marks.

(b) Candidates were asked to give the advantage of the safe edge when using the file.

The expected response was that it allows filing into the corner without damaging the edge. Again this proved to be a challenge to a majority of the candidates. There were many different responses that were given by candidates which were not acceptable.

Question 10

Candidates were expected to complete a list of three main reasons for finish on wood.

The expected response was; to improve **appearance/decoration**. This question was well done; a majority of candidates were able to give the correct response. There were very few that gave dissenting responses such easy to clean, to last longer etc. and these were not awarded marks.

Question 11

Candidates were given two sketches of a lap joint.

(a) Candidates were requested to name a tool that could be used to mark line A which was on the end of the wooden work piece.

The expected response was marking gauge. Only a fair number of candidates were able to give the correct response. A majority of other candidates gave try square as a response and was not accepted in this instance, this resulted in the loss of the 1 mark.

(b) For this question candidates were asked to name one appropriate saw that could be used to remove the labelled waste.

The expected response was **tenon saw** or **dovetail saw. This question was answered well by a majority of the candidates.** There were very few that gave responses such as hack saw, cross-cut saw etc. and these for obvious reasons were not acceptable.

Question 12

For this question candidates were given a sketch of a plastic bowl. They were required to name the process of making the bowl.

The expected response was one of the three (3) responses; vacuum forming, blow moulding and press forming. A majority of candidates were able to produce the expected response. Only a small fraction gave wrong answers.

Question 13

Candidates were given a statement to effect that they were to design and make a soup bowl for a toddler. They were then required to state two safety specifications to be considered when making the bowl.

The expected response was one of the following; non-toxic, light in weight and avoid sharp edges**.** A fair number of the total candidature was able to give the expected response. The other fraction gave dissenting responses such as wear goggles, put on mask and other safety precautions observed in the workshop. This was a clear indication that some candidates did not understand the question.

Question 14

For this question candidates were presented with an incomplete information on fittings and fixings. They were then asked to complete the table by filling in missing information.

The expected responses were: joining materials temporarily, butt hinge and keep cupboard door closed respectively. This question was poorly done as a majority of candidates failed to produce the expected responses. A majority managed the second point and this did not help much in amassing the total mark allocated to this question.

Question 15

Candidates were given a drawing of a mechanism that converts rotary motion to reciprocating motion.

(a) Candidates were required to name the mechanism.

The expected response was cam and follower, however, candidates gave responses such as cams and pear-shaped cam were awarded with the one mark designated for this question. This question was well answered. A majority of candidates were able to give expected response. Very few were giving differing responses.

(b) For this question candidates were required to name one machine where the mechanism named (a) has been applied.

Expected response was one of the following and any relevant response; sewing machine, jig saw, engine, toy car. A majority of candidates were able to give the expected response.

Question 16

This question stated that plastics are classified into two main groups; thermoplastics and thermosetting plastics. Candidates were asked to give one characteristic of thermoplastics.

The expected response was that polymers are not cross-linked or can be reheated/recyclable. A majority of candidates were able to give the expectant response. Only a few candidates were giving dissenting responses such as; once shaped cannot be reshaped etc.

Question 17

Candidates were required to give one reason why a hacksaw is suitable for cutting plastic.

The expected response was that the hack saw has fine teeth. Only a fair number of candidates were able to give the expected response. The rest of the candidates were not able to come up with the expected the response they gave many different responses which were not awarded with the designated one (1) mark.

Question 18

Candidates were given a sketch showing the process of cutting a piece of wood. They were then required to name the holding tool shown in the sketch.

The expected response was bench hook. A slightly more than half of the total candidature was able to give the expected response. The other fraction of the candidature gave different responses such as holding device, tenon saw, dovetail saw etc. However, these other responses were not awarded marks.

Question 19

For this question candidates were given an image of a manufactured board.

(a) Candidates were required to name the manufactured board.

The expected response was multi-ply wood, shatter ply was also accepted because it is the name used in the commercial world. A majority of candidates were able to come up with expected response, in essence this question was well done.

(b) Candidates were required to give one advantage of manufactured boards.

This question was asked in manner that it was looking for a general advantage of manufactured boards, not necessarily the multi-ply wood. This could be only one of; uniform strength in all directions, does not warp/shrink, available in wide sizes, ready to be used.

Question 20

Candidates were given a small version and an incomplete big version of a logo for a sports company. Candidate were required to complete bigger logo using geometrical constructions.

The expectation was that candidates would transfer angle ABD using geometrical construction to point C'. One (1) mark was awarded for an evident line and the other mark was awarded for accuracy of line through correct constructions. A majority of candidates were only able to get one (1) mark for the evident line. Most candidates failed to construct the line following proper geometrical constructions.

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 card model of a toy in isometric projection, they were also given an incomplete third angle projection of the same toy.

(a) Candidates were required to complete the plan view.

The expectation was that candidates would complete the box for the front elevation using feint lines. This was to enable the projection of the end view to assist in the construction of the front view. Then they would project lines from the front view and the end view to complete the plan. They were then supposed to line in where there to be solid lines to give the required portions of the plan. Not many candidates were able to amass the total marks allocated to this question. A majority were able to get the two (2) marks for the two portions of the plan. Another small fraction was able to get up to four (4) marks.

(b) Candidates were required to draw a symbol of projection.

The expectation was that candidates would draw the two (2) concentric circles as well as the two centre lines. It was then expected that they would draw the tapered shaft with the smaller end towards the circles. This proved to be a challenging question as most of the candidates failed to give the expected response. Some candidates did not even attempt the question. Some drew dotted lines instead of centre lines and they lost a mark for that, others wrongly positioned the tapered shaft.

Question 2

For this question candidates were given two views of a desk tidy (hexagonal prism) in orthographic projection. Candidates were asked to draw a development (net) of the desk tidy given point X as the starting point. Candidates were asked not include the base.

Candidates were expected to project horizontal lines from the front view. They were then expected to take the length of one side of the hexagon using a pair of compasses, then using that radius to mark six times on the horizontal line starting from **X**. From point **X** to the six marking they expected to project folding line touching the top horizontal line. This question proved to be challenge to most of the candidates. A bigger portion of the candidature failed to show projection lines and they ended up losing the mark. Others did not show folding lines using dashed lines as expected. Other candidates completely misunderstood the question and ended up drawing another hexagonal shape. There were, however, those candidates that amassed the total marks.

Question 3

For this question candidates were given an image of a bell crank mechanism, they were also given an incomplete line diagram representing the bell crank mechanism. Candidates were required to plot the locus of point P which was located on the connecting rod, as the crank was rotating.

Candidates were expected use OA as the radius to draw a complete circle. Then divide the circle into twelve equal parts. Then take the length of AB using a compass and then put the compass point on every division and marking on the horizontal line. Thereafter connect the markings with lines. They were then expected to take distance AP and mark it on the connecting lines. Lastly, they were then expected to connect the dots to produce a smooth locus. This question proved to be challenge to a majority of the candidates. Very few candidates were able to come up with the expected response. Others simply left the question unattended.

B2 – Resistant Materials

Question 1

Candidates were given sketches of a cellphone display made of acrylic.

(a) Candidates were required to give one reason why acrylic was suitable material for the stand.

The expected response that acrylic is stiff, easy to cut and light in weight. A majority of the total candidates were able to give correct answer, there were few, however, who gave properties that were not relevant to this question.

(b) For this question candidates were asked to explain how the R10 corner could be produced to a smooth finish after marking.

Candidates were expected to outline the process in this way; cut the curve with a coping saw/fret saw, perform rocky filing and lastly use abrasive to produce smooth edges. A good number of candidates managed to amass two marks from the total three marks. Most candidates were able to state rocky filing and abrasive paper.

(c) Candidates were asked to use sketches to show how the joint could be strengthened whilst maintaining the 90^0.

It was expected that candidates would use their creativity plus knowledge and understanding and show how the joint could be strengthened. They were also expected to produce a clear sketch that communicates well. This question posed a great challenge to a large majority of candidates, as result most candidates did not attempt it. Other candidates drew the sketch but failed to show how the joint could be strengthened.

Question 2

Candidates were given an exploded view of a side table made from South African pine.

(a) Candidates were asked to name the joint that was used to join the legs of the table.

The expected response was cross-halving joint. Only a fair number of the total candidature was able to give the expected response. The rest of the candidates gave many different responses such as housing joint, dovetail joint etc., and these were not awarded the one (1) mark designated for this question.

(b) For this question candidates were required to name three (3) tools could be used to mark out the 15^0 slope.

The expected response was; sliding bevel, try square/combination and pencil/marking knife/protractor. A majority of the candidates were able to give expected response.

(c) Candidates were asked to state two reasons why the curves have been cut on the legs.

Candidates were expected to give any two of; stability, decoration and reduce weight. This question was well answered; a majority of candidates were able to give the expected response.

(d) For this question candidates were asked to draw and label the three holes that are drilled before fitting a countersunk head screw to join wood together.

The expectation was that candidates would draw the countersink, clearance and pilot hole. Not very many candidates were to able sketch the three (3) holes as expected, overall this question was poorly done. Some candidates did not attempt the question at all.

Question 3

Candidates were given an incomplete design for a holder to support a roll of wire. The stand was to be made of mild steel.

(a) Candidates were required give two reasons why mild steel was a suitable material for the holder.

The expected response was two of; ductile, easy to work with, easy to bend and availability. Slightly over half of the total candidature was able amass the total marks allocated to this question. Another substantial fraction managed only one (1) mark, the rest of the candidates could not obtain any mark.

(b) Candidates were given a marked out development of the stand. They were then required to name the tools used to mark out.

The expected response was; **A** – scriber, try square; **B** – centre punch; **C** – spring divider, wing compass. Only a fair number of candidates was able to give the expected response. Candidates performed better in **A** and **B**, **C** proved to be challenge to a majority of the candidates.

B3 – Systems and Control

Question 1

Candidates were given a drawing of a sign board.

(a) Candidates were required to state the type of force that acting on the post on a windy day.

The expected response was torsion/twisting. A majority of candidates were able to give the expected response, only a few deviated from the expected response giving responses such as bending, etc., and these were not accepted.

(b) Candidates were required to show on the drawing how the sign board could be made more rigid.

The expected response was an added element forming triangulation to the sign board. Only a small fraction of the total candidature was able to give the expected response, a majority of candidates did not attempt this question and that led to the loss of the one (1) mark.

Question 2

Candidates were given a drawing of a hand pump. They were then asked to label the fulcrum, load and effort.

The expected response was load on the left, fulcrum and effort on the right respectively. A majority of candidates wrote the expected response, only a few confused the arrangement and that made them lose marks.

Question 3

Candidates were named the type of cam that show below.

The expected response was pear shaped/egg shaped cam. This question was well answered, a majority of candidates nailed it. Only a few candidates were not able to come up with the expected response. Cam alone was not accepted because it did discriminate not from the other cams.

Question 4

Candidates were given sketches of two mechanisms labelled A and B respectively.

(a) Candidates were asked to name mechanism A.

The expected response was belt and pulley. A majority of candidates were able to give the expected response.

(b) Candidates were asked to name mechanism B.

The expected response was spur gears. A majority of candidates were able to give the expected response, very few gave dissenting responses which were obviously not accepted.

(c) Candidates were asked to state the advantage of mechanism B over mechanism A.

The expected responses was; positive engagement, does not slip, no snapping of belt. This question proved to be very tough to a great majority of candidates. Very few were able to give the expected responses. Some gave many different wrong responses and, others did not attempt the question at all.

Question 5

Candidates were asked to classify the structures that given in the table that was below.

The expected responses were natural, artificial and artificial respectively. Only a fair number of the total candidature was able to give the expected response. Other candidates gave responses such as frame structure, shell structure etc., and these were not accepted.

Question 6

Candidates were given an image of a type of gears. They were then asked to state correct name of the gears.

The expected response was **bevel gears.** This question was well answered as well. A majority of candidates were able to give the expected response. Only a small minority gave wrong answers such as spur gears, train gears, etc., and as expected they were not awarded the mark.

Question 7

Candidates were shown a pair of scissors in use. They were then asked to name the type of force applied by the blade of scissor on the cut material.

The expected response was shear force. A majority of the candidates were able to give the correct response. Only a few candidates gave different responses such as tension, torsion etc. and these were not awarded the one (1) mark.

Question 8

For this question candidates were given a drawing of a linkage mechanism. They were then required to indicate the direction of the output motion of the mechanism.

The expected response was an arrow pointing to the left place the bottom lever showing the output motion. This question was well done. A great majority of the total candidates were able to show the correct direction. Very few candidates pointed to the wrong direction. There were also those who left the question unanswered.

Question 9

Candidates were asked to make a neat two dimensional (2D) labelled sketch of a rack and pinion.

Candidates were expected to draw a simple bar with gears on one side, and also draw a circular disk with matching gears with those on the bar. A majority of candidates were able to give the expected response, though some candidates drew the gears in pictorial view, however, these were accepted.

Question 10

Candidates were required to complete the diagram to show a second class lever.

The expected response was small triangle at the end of the bar facing upwards to symbolising a fulcrum. An arrow facing downwards in the middle of the bar was also expected, to show the load. Only a fair number of candidates was able to amass the two marks allocated for this question. The other portion of candidates gave dissenting responses, some made the drew the arrows for the load and the fulcrum to face the same direction, while others confused the positions of the fulcrum and the load.

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General Comments

One hundred and eight (107) Centres registered candidates for the coursework. Of the Centres, two thousand five hundred and eighteen (2518) were registered. This number indicates an increase when compared to the number of candidates who were registered for the examination in the year 2020.

The coursework for Junior Certificate 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 centrered on the chosen prescribed theme. In 2021, the theme was Portability. The coursework is expected to be worked over the final two terms of the year. Candidates' folders were presented for marking.

Challenges and Recommendations

Generally, the performance indicated a decline to most centres. This also includes the work presentation that was displayed on the folio booklets. Most work presented by the candidates was average and indicated a decline to most centres. A whole lot of centres submitted work that had some unattended sections of the design process. However, some few centres performed exceptionally well. Centres need reminding that when candidates undertake this component, it is an examination. Therefore, candidates should be the ones doing the work from start to finish. No one else needs to do the work on behalf of the candidate, be it written or sketching work.

Realisation Summary Form

This year no product realisation summary form was sent to centres because candidates were required to make a model instead of the normal product. No product realisation mark was included in the assessment of this year's coursework. However, candidates were expected to make a model and conduct a Testing and Evaluation of that model under the given theme. Some candidates did not produce the model but only did the mock-up. This resulted in candidates using the mock-up again in the testing and evaluation which resulted in the loss of marks.

Comments on individual assessment objectives

Theme analysis

This objective was well done by most candidates. Most candidates defined the theme by providing three definitions which is highly commendable. Candidates are advised to define the theme without using the key words of the theme. Few candidates did not indicate their area of interest in the theme analysis and some indicated very few general areas. Candidates must be advised to clearly indicate the area of interest and also write the area of interest in the space provided. For example, PORTABILITY – Home – doors – keys. In some centres candidates provided theme analysis (bubble charts) with limited links (must have at least three links).

Identification of the need

Almost all centres completed this objective. Centre assessment of this objective was reasonably accurate, although the design brief of some candidatesdid not indicate that they were intending to design and make a model as per the instructions of this year's coursework. It is worth noting that some centres showed less initiative in terms of adventure hence a lot of candidates were designing around one concept in one centre. So much work is needed in broadening the scope or opportunities of designing under the given theme.

Research into design brief resulting in specifications

Very good work was seen that demonstrated an excellent understanding of the requirements. Candidates should note that research should cover a wide range of existing idea. Ideas must not be of single concept and should also include relevant identified and collected data. However, it is no use pasting in pictures without making meaningful evaluation of the existing ideas (stating two advantages and two disadvantages). Most candidates' conclusion on existing ideas lacked meaning. They did not draw their conclusion in relation to the design brief. Some were choosing best ideas instead of concluding on the existing ideas. It was good to note that most candidates included the design specifications in their research although to some candidates it was less specific. Design specifications has a lot of subtopics, however function is the most important.

Generation of ideas

Many candidates produced a wide range of ideas which were properly evaluated. Some candidates displayed good graphic skills. Candidates should be discouraged from focusing on a single concept and producing ideas similar to the existing products. Candidates are advised to indicate their chosen idea and justify their choice. Common methods of drawing techniques including two dimensional and pictorials were used by candidates effectively. Colouring and shading help improve the quality of presentation. Other factors such as availability of resources should be considered when deciding the final project. Candidates

who did not only annotate possible ideas but also did not indicate constructional details lost marks. Candidates are also advised to produce a key for the evaluation matrix.

Development of proposed solution

This was a challenging objective to most candidates. 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. It is commended that most candidates made mock-ups, however some candidates lost marks because they did not test their mock-ups. Candidates are advised to draw and render the final idea with all justified changes included. It is advised that candidates should make mock-ups and test them. Only a few candidates made reasoned decisions about form, materials, construction methods etc.

Planning for production

A few candidates produced some good clear working drawings. This was not impressive in many folders. Few centres performed well in this section. Candidates did not have well drawn, well dimensioned working drawing. In some instances some centres did not produce the planning for production part. The usage of a pencil is advisable for drawings. However it is advisable to state scale, correct dimensions and method of projection if orthographic projection is used. Candidates are encouraged to include tools needed to produce the artifact and the processes involved.

Product realization

This objective was not awarded with marks this year, however candidates were advised to make a model. Candidates were not expected to show picture of the model under construction. The expectation was that it was only going to be seen during testing.

Testing and evaluation

This objective was the most problematic because most candidates did not do it. For the few that did attempt, it was badly done. Most candidates' testing was superficial in that it did not take into account the environment for which it was designed. The use of pictures with comments to show the evidence for testing is to be encouraged. Centres are advised to encourage candidates to evaluate their products against the specifications. Many candidates lost marks in this section because they never evaluated but their response was simply rewriting their design specifications. In this section candidates are also required to state future modifications and justify their modifications. Centres should encourage candidates to suggest modifications relevant to the product. In addition such suggestions should seek to improve the product.