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A. STATISTICAL INFORMATION
The total number of candidates who registered to sit for Engineering Drawing was 3.
Table 1 shows the distribution of grades for the First 2019 session of the examination.

<table>
<thead>
<tr>
<th>GRADE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>ABS</th>
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<tbody>
<tr>
<td>No. of Candidates</td>
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<td>1</td>
<td>1</td>
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<td>% OF TOTAL</td>
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<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>0</td>
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<td>100.0</td>
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</table>

Table 1: Distribution of grades for Engineering Drawing 2019 First Session

B. GENERAL REMARKS
Paper 1 is common to both Graphical Communication (AM 15) and Engineering Drawing (AM09). Some candidates were very well prepared for the examination. They presented their solutions in a very orderly manner and were able to solve problems by making use of various skills which they acquired through hard work and continuous practice. Other candidates, although less prepared, managed to present some adequate solutions. However, about a quarter of the candidates were evidently unprepared and lacked depth of knowledge. This was evident from the solutions they presented as most of these candidates copied the given drawings and did not progress any further.

C. COMMENTS ON PAPER I AND PAPER II
Paper 1
The candidates were asked to attempt five questions from the six presented.

Question 1: Traces of planes (20 marks)
Pictorial and orthographic drawings of a machined solid right cylinder were given. The cylinder had a flat face parallel to its axis and a coaxial hexagonal hole. The traces of the oblique plane, which cut the upper portion of the solid, were also given.
The candidates were asked to copy the given views and project an auxiliary elevation to determine the true inclination of the oblique plane to the horizontal plane. In the auxiliary elevation, the oblique plane was represented as a section plane. They were also asked to complete the given drawings, by showing how the front elevation appears after being sectioned by the oblique plane, and project an end elevation on the left-hand side of the elevation drawn. The true shape of the sectioned face was to be determined by constructing a second auxiliary view projected from the first auxiliary elevation.
Most candidates attempted this question. The average mark was 10 / 20. Only a few candidates managed to present a flawless solution. Other candidates lost marks for the following reasons:

- Some candidates only managed to copy the given views attaining just 2 marks.
- Others succeeded to convert the oblique plane into an inclined plane but seem to have forgotten the subsequent steps.
• A few candidates mistook the vertical trace with an inclined plane and projected a sectioned end
elevation of the right cylinder and the hexagonal hole. This presented an incorrect solution.
• The majority of the candidates showed that they were not familiar with the method of constructing a
second auxiliary view. Others made a poor attempt by drawing the X2-Y2 line and were confused from
where to transfer the required measurements.
• Untidy presentations and roughly drawn curves were also noted.

<table>
<thead>
<tr>
<th>1 to 9 Marks</th>
<th>10 to 19 Marks</th>
<th>Full Marks</th>
<th>Not Attempted</th>
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<tbody>
<tr>
<td>14</td>
<td>7</td>
<td>4</td>
<td>5</td>
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**Question 2. Trochoids (20 marks)**

A drawing and a pictorial illustration of a flanged wheel, which was constrained to roll on a partly straight
and partly curved track, were given. The candidates were asked to plot the locus of a point situated on the
outside circumference of the flange, as the wheel rolls on its inner circumference for two consecutive
revolutions. They were also asked to construct the instantaneous radius of curvature, the tangent and the
normal at an indicated position.

Most of the candidates attempted this question. Their average mark was 11 / 20. Most candidates showed
that they did not cover completely the topic 'Cycloidal Curves', that is the construction of the cyloid,
epicyloid, hypocycloid and their derived curves (as stated in the syllabus). Others lost marks for the following
reasons:

• Some candidates only managed to copy the given drawing.
• Others copied the drawing incorrectly and consequently proceeded to produce a solution which was
different from that expected.
• Other candidates mistakenly rotated the flanged wheel in the opposite direction and therefore
plotted the locus of point P in an incorrect manner.
• Quite a few candidates marked the distance travelled by the flanged wheel inside the curved track
directly on the arced path created by the centre of the wheel instead of marking on the curved track.
This resulted in a distorted locus of point P.
• There was one instance where the curved track was divided by using the division of a line method.
• Only a few candidates attempted to locate and construct the requested instantaneous radius, the
normal and the tangent on the superior trochoid.
• Most candidates stated the technical names of the curves incorrectly. Some of the names given were
not even related to the cycloid group of names. Other names were a mixture of terms related to conic
sections and cycloidal curves.
• Neatness and presentation were lacking in most solutions.

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<th>Not Attempted</th>
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<tbody>
<tr>
<td>9</td>
<td>15</td>
<td>1</td>
<td>5</td>
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Question 3. Interpenetration of solids (20 marks)

A three-dimensional illustration and two orthographic views of three combined solids (cylinder, cone and sphere) were given. Candidates were asked to copy the orthographic views and determine the curves of intersection between the solids.

Most candidates attempted this question. The average mark was 6 / 20. As the average mark implies, most of the candidates fared badly in this question. The following is a list of shortcomings noted by the markers:

- More than half of the candidates who attempted this question simply copied the given drawings.
- Other candidates confused the generators method with the section planes method.
- The main problem was with the intersection between the cone and the sphere. Some candidates drew section planes cutting the cone and sphere perpendicular to the axis of the cone. However, these cuts were not represented as concentric circles in the other elevation. Having forgotten this step, the candidates were constrained to draw a freehand curve of intersection without plotting the proper intersecting points.
- Some other candidates made basic mistakes like confusing the first angle with the third angle projection. Others drew the 45° line (mirror line) facing the opposite direction thus inverting the resulting projected elevation.
- On a few solutions the curve intersection between cylinder and the cone was correctly solved by using the generators method.

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<th>Full Marks</th>
<th>Not Attempted</th>
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<tbody>
<tr>
<td>24</td>
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<td>0</td>
<td>2</td>
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Question 4. Construction of a Plate Cam (20 marks)

A 2-D drawing and an illustration of an offset roller ended follower operating on a plate cam were given. The candidates were asked to construct the profile of the cam by using the given dimensions, plot the locus of the roller centre and construct the cam follower displacement diagram. The cam revolved at one revolution every 2 seconds.

Most of the candidates attempted this question. The average mark was 12 / 20. The following are the markers’ remarks:

- Most candidates managed to construct the profile of the cam correctly by adopting the principles of the tangential arcs.
- A considerable number of candidates did not notice that the follower was offset and presented a solution as if the follower was in-line with the camshaft. When the follower is offset, the construction of the cam profile is totally different. Candidates were expected to draw tangent lines to the R 25 circle (the offset horizontal distance between the cam centre and the centre of the follower). These candidates erroneously drew radials from the cam centre. This obviously resulted in an incorrect follower displacement diagram.
- Several candidates did not complete the solution. Some stopped after just copying the cam profile while others did not attempt to project the points from the cam profile to the displacement diagram.
**Question 5. Framework (20 marks)**

A space diagram of a hinged framework was given. The candidates had to copy the space diagram by using the indicated scale. They were also asked to determine graphically the magnitudes of the reactions and the stresses in the rods. They were finally asked to distinguish between the struts and the ties. Nearly all the candidates attempted this question. The average mark was 10 / 20. Marks were for the following reasons:

- Some candidates only copied the space diagram without progressing any further.
- Several candidates ignored the fact that the framework was supported from one side and tried to solve the problem as if the framework was supported from below. Some needlessly constructed the bending moment and even the shear force diagram.
- To distinguish struts from ties some candidates were rather confused and forgot that, if the forces which act at the joints at the ends of a member tend to shorten them, then the member is in compression. Conversely if the internal forces in a member pulls at the joints then the member is in a state of tension.
- Only a few candidates tabulated neatly the magnitude and nature of forces in all the rods.
- In some cases, the magnitude and direction of reaction at the hinge was not included.

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<th>Not Attempted</th>
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<tbody>
<tr>
<td>7</td>
<td>16</td>
<td>3</td>
<td>4</td>
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**Question 6. Solid of revolution / Intersecting solids (20 marks)**

An illustration and two orthographic views of a machined solid were given. The cylindrical solid was turned at one end to form a spherical nosed cone. The other end of the cylinder was gradually stepped down making a fillet. The solid was machined at both sides forming two flat parallel surfaces. A square hole was machined through the upper conical part.

The candidates were asked to draw the given views. They were also asked to project an end elevation and complete the plan showing the curves of intersection resulting from the machining.

Only half of the candidates attempted this question. The average mark was 5 / 20. As indicated by the given statistics this was the least popular question. The following are the remarks made by the markers:

- Half of the candidates who attempted this question copied the given drawing and drew a series of horizontal section planes across the zone occupied by the change of profile in the front and end elevation.
- Some candidates confused the two methods of locating the points to plot the curves of intersection resulting from the machining of the solid of revolution. These candidates drew section planes on the
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front elevation and drew generators on the plan (instead of drawing concentric circles). This resulted in an incorrect solution.

• Others drew the curves of intersection freehand without showing any proof of how the intersecting points were located.

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<th>Full Marks</th>
<th>Not Attempted</th>
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</thead>
<tbody>
<tr>
<td>13</td>
<td>1</td>
<td>0</td>
<td>16</td>
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Paper 2

No comments on the candidates’ performance may be given. Any attempt to comment will jeopardize the candidates’ privacy.

Chairperson

Examiners Panel 2019