Instructions to candidates:

1. Answer ALL questions.
2. Write all your detailed solutions (including rough work) in the blank space provided after each question.
3. Use ONLY pencil for drawing graph.
4. Programmable calculators and electronic dictionaries are not allowed to be used.
5. Unless otherwise stated, all decimal answers should be correct to two decimal places and angle measurement correct to one decimal place.
6. This paper consists of 9 pages.

FOR OFFICIAL USE ONLY

<table>
<thead>
<tr>
<th>QUESTION ANSWERED</th>
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<tbody>
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<td>TOTAL</td>
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</table>
1. The following table shows the horse power \( P \) of an engine for different speeds \( S \).

<table>
<thead>
<tr>
<th>( S ) (rev/min)</th>
<th>1200</th>
<th>1350</th>
<th>1500</th>
<th>1650</th>
<th>1800</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P ) (hp)</td>
<td>270</td>
<td>310</td>
<td>350</td>
<td>390</td>
<td>430</td>
</tr>
</tbody>
</table>

If the law relating \( P \) and \( S \) is of the form \( P = aS + b \), plot a best fit line on the following graph paper to estimate the values of the constants \( a \) and \( b \). [10 marks]
2. (a) Solve the equation \[
\frac{1}{x - 1} - \frac{1}{x + 2} = \frac{1}{16}
\]

(b) Find the values of \(x\) and \(y\) which satisfy the simultaneous equations:

\[
\begin{align*}
2x + 1 &= 3(y - 1) \\
6(2y - 1) &= 5x
\end{align*}
\]

[13 marks]
3. (a) (i) Simplify the expression $\frac{5^0 \left( \frac{1}{x^3} y^3 \right)^3}{\left( \frac{1}{x^2} y^2 \right)^2}$

(ii) Reduce $\frac{2}{n-2} - \frac{3n+1}{n^2 + n - 6}$ to a single fraction.

(b) Given $T = 2\pi \sqrt{\frac{W}{GL}}$, express $L$ in terms of $T$, $W$, $G$ and $\pi$. [13 marks]
4 (a) If a discount of 20% reduced the price of an item to $100, find the original price of the item.

(b) 220 boys and 180 girls sat for an examination. If 65% of the boys and 75% of the girls passed, what percentage of the total number of candidates passed?

(c) The external and internal radii of a copper hemispherical bowl are 10 cm and 9 cm respectively. If the density of copper is 8.9 gm/cm$^3$, find its weight in gm correct to 1 decimal place.

[16 marks]
5. (a) Convert the angle $142^\circ$ to radians.

(b) In the figure, $ABC$ is a semi-circle centre $O$ with radius $OC = 3$ cm, perpendicular to the diameter $AB$. An arc of a circle is drawn with centre $B$ and radius $BC$ intersecting $AB$ at $D$.

Find:
(i) the angle CBD.
(ii) the length of $BC$.
(iii) the area of the sector $BCD$.
(iv) the shaded area.

[18 marks]
6. The figure below is a solid triangular prism. Its base BCZY is a rectangle. The triangles ABC and XYZ are vertical and the faces ABYX and ACZX are rectangles. Calculate
(a) the height of A above the base,
(b) the volume of the prism,
(c) the total surface area of the prism and
(d) the angle CPZ where P is the midpoint of BY.

[17 marks]
7. The two cylinders shown below are geometrically similar. Their heights are 20 cm and 30 cm, respectively.

(a) If the surface area of the large cylinder is 1350 cm$^2$, what is the surface area of the small cylinder?
(b) If the volume of the small cylinder is 1005 cm$^3$, what is the volume of the large cylinder?
(c) If the diameter of the base of the large cylinder is 12 cm, what is the diameter of the base of the small cylinder? 

[13 marks]
SINGAPORE POLYTECHNIC MATHEMATICS ENTRANCE TEST

Name : _______________________________ In chinese (if applicable): __________________

Passport / ID No: _______________________________ Seat No: _______________________________

Test Venue: _______________________________ Date: _______________________________