DURATION: 3 HOURS

TOTAL MARKS: 100

INTERNAL EXAMINER: DR V. TRAMONTIN
EXTERNAL EXAMINER: MR D. A. NURAMO

INSTRUCTIONS:

1. Answer all questions. Marks are allocated to each question.
2. Sketching is important. Instruments should be used and all sketches should be to an approximate scale, i.e. in proportion. It is preferable that the approximate scale be stated.

NOTES:

1. THIS IS A CLOSED BOOK EXAM
2. THIS EXAM COUNTS 60% TOWARDS THE FINAL MARK FOR THIS MODULE
3. ANSWER SECTION A ON A SEPARATE BOOKLET FROM SECTION B (SECTION A: BLUE BOOKLET; SECTION B: GREEN BOOKLET). SHOW RELEVANT WORKING FOR Q. 1 IN THE HANDBOOK AND FILL THE RESULTS IN TABLES 1 AND 2 ON THE QUESTION PAPER.
SECTION A: SITE SURVEYING [20 MARKS]

QUESTION 1

a) You are asked to level from a bench mark (DBM1) with a known height of 1238.965m above sea level to another bench mark (DBM2) with a known height of 1239.161m above sea level. The raw field book is shown below. Reduce the observations, showing all checks, to find all the final heights for ZXP1, ZXP2 and ZXP3. Fill in the spaces in Table 1.

Table 1: Levelling

<table>
<thead>
<tr>
<th>Point Name</th>
<th>BS</th>
<th>IS</th>
<th>FS</th>
<th>RISE</th>
<th>FALL</th>
<th>Reduced Level</th>
<th>Correction</th>
<th>Final Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBM1</td>
<td>1.268</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXP1</td>
<td>2.498</td>
<td>0.421</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXP2</td>
<td>1.372</td>
<td>0.852</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXP3</td>
<td>0.136</td>
<td>2.498</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBM2</td>
<td>1.298</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ e = \]
\[ corr = \]

(10 Marks)

b) You are asked to take horizontal angles at DBM2 between Point DBM1 and two new points, TPX1 and TPX2, using the Trimble MR3 Total Station. The observations have been reduced partially for you. Calculate the Corrected Mean and Reduced Mean Angles for each of the points in the Table 2.

Table 2: Angle Measurement

<table>
<thead>
<tr>
<th>PNT</th>
<th>READINGS</th>
<th>SIMPLE MEAN</th>
<th>RO Corr</th>
<th>Corr. MEAN</th>
<th>REDUCED MEAN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FL</td>
<td>FR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBM1</td>
<td>004° 08' 56&quot;</td>
<td>184° 08' 20&quot;</td>
<td>004° 08' 30&quot;</td>
<td>0°</td>
<td></td>
<td>(2 marks)</td>
</tr>
<tr>
<td>TPX1</td>
<td>103° 16' 31&quot;</td>
<td>283° 16' 10&quot;</td>
<td>103° 16' 21&quot;</td>
<td>-3°</td>
<td></td>
<td>(2 marks)</td>
</tr>
<tr>
<td>TPX2</td>
<td>159° 09' 38&quot;</td>
<td>339° 09' 18&quot;</td>
<td>159° 09' 28&quot;</td>
<td>-6°</td>
<td></td>
<td>(2 marks)</td>
</tr>
<tr>
<td>RO</td>
<td>004° 08' 46&quot;</td>
<td>184° 08' 30&quot;</td>
<td>004° 08' 38&quot;</td>
<td>-8°</td>
<td></td>
<td>(2 marks)</td>
</tr>
</tbody>
</table>

(2 marks) for calculation

(10 Marks)

TOTAL [20 Marks]
SECTION B: CONSTRUCTION TECHNOLOGY [80 MARKS]

QUESTION 2 (ROOFS) [22 MARKS]

(a) Draw the following construction details relating to the roof for a project of a residential building (gable-to-gable rectangular building) in Durban. The roof construction is timber W-type trusses, the roof covering is fibre-cement corrugated sheeting.

i. Draw a well-labelled and detailed section at the ridge of the roof. [6 MARKS]

ii. Draw a fully annotated and detailed section through the closed eaves of the roof, including the intersection with an external cavity wall. Show also the ceiling, the gutter, gutter fixings and rainwater downpipe until the swan neck. [12 MARKS]

iii. Include in your drawings the elements that you would incorporate, also specifying what materials you would recommend, to achieve a good thermal performance of the roof assembly, with reference to the climatic conditions of the area in which the project is located. Briefly justify the reasons for your choice. [4 MARKS]

QUESTION 3 (DOORS/WINDOWS) [18 MARKS]

You have been asked by a client to recommend door and frame combination types for the positions listed below. Provide three different appropriate solutions (one for each position), describe the constructional and aesthetic differences between each (also providing sketches to illustrate your points), as well as describing the ironmongery and finishing treatment that would typically be used in each case. Each door type, as well as framing members should be named in accordance with the usual terminology adopted in the industry.

i. Front door – must be good quality as it is visible from the road outside the property
ii. Internal door to the main bedroom
iii. Rear kitchen door – not in public view and should provide natural ventilation if possible.

QUESTION 4 (CEILINGS AND FINISHES) [16 MARKS]

(a) Provide an in-depth explanation of the two main types of ceiling systems, with the aid of sketches indicating principal components. [12 MARKS]

(b) What is gypsum plasterboard and what are two of its advantages? [2 MARKS]

(c) If I did not want to use gypsum plasterboard, what other types of board finishes could I use in my ceilings? [2 MARKS]

QUESTION 5 (PLUMBING, DRAINAGE, ELECTRICAL INSTALLATIONS) [24 MARKS]

(a) Your client is considering building a house in a rural area where a municipal sewage reticulation is not available. She has been advised to use a septic tank for on-site sewage treatment and disposal. Explain to her under what circumstances a septic tank should be used, what the basic principles involved in its operation are and how a drainage installation including a septic tank works. [12 MARKS]

(b) Provide a well-labelled section through a typical septic tank. [6 MARKS]

(c) Explain the following terms with reference to electrical installations:

i. single-phase supply;
ii. three-phase supply;
iii. distribution board;
iv. earth leakage unit;
v. conduits;
vi. trunking. [6 MARKS]

END OF PAPER [100 MARKS]