

Specialist Diploma: Offshore Engineering

Thursday 4 January 2018

Timetable: 09.30 – 13.00

Notes to Candidates

1. TO PASS THE EXAMINATION, CANDIDATES MUST SATISFY THE EXAMINERS IN BOTH PARTS OF THE QUESTION.
2. Examiners will only mark work written by hand during the examination. Candidates will not be allowed to include any previously prepared calculations, notes, sketches, diagrams, computer output or other similar material in their answer sheets. Any previously prepared information submitted by candidates will be ignored by the examiners.
3. A fair proportion of marks will be awarded for the demonstration of an understanding of fundamental engineering concepts, as distinct from calculation of member forces and sizes. NOTE: In the calculation part, establishing “form and size” is taken to mean compliance with all relevant design criteria, i.e. bending, shear, deflection, etc.
4. 60 marks are allocated to Section 1 and 40 marks to Section 2.
5. The Examiners are looking for sound structural designs. It should also be remembered that aesthetics, economy and function are important in any competent engineering scheme.
6. Any assumptions made and the design data and criteria adopted must be stated.
7. Good clear sketches are required; they should show all salient and structural features and should incorporate adequate details.
8. Candidates may not bring into the examination room any electronic devices capable of wireless communication, optical photography or scanning.

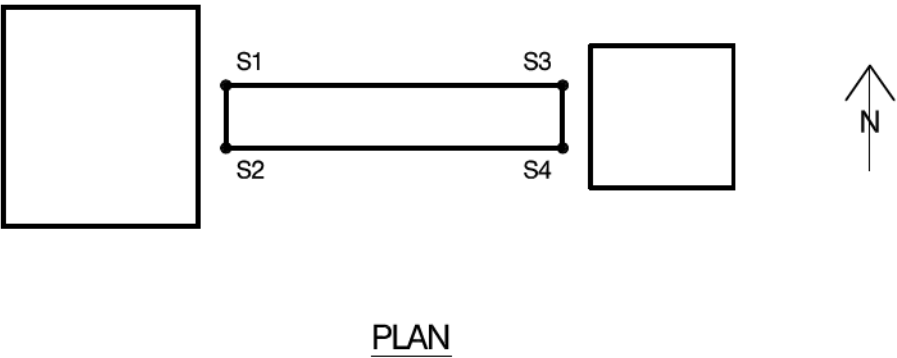
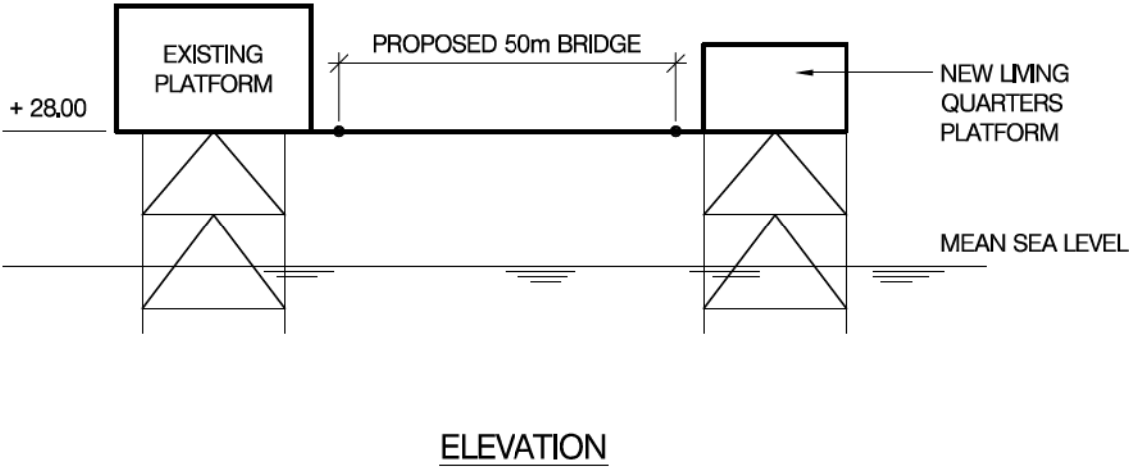
The following devices are not permitted:
Mobile phones, laptops, notebooks or portable computers and similar devices, iPads, tablets and similar devices, E-readers (e.g. Kindle) and similar devices, cameras, optical scanners and similar devices.

Any candidates arriving at the examination room with such devices will be asked to switch them off and place them in a sealed bag kept by the Invigilator for the duration of the exam.
9. This paper is set in SI Units.
10. Candidates should note that Figures are produced to illustrate the question and are not necessarily drawn to scale. Figured dimensions should be followed.

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A reminder on codes of practice

Any design code or standard may be used to answer the question in the paper, as long as reference to that code is consistent throughout and any assumptions made or design data adopted (including loadings other than those specified in the question) are stated at the beginning of the answer.



NOTE: All dimensions are in metres

FIGURE 1

New link bridge

Client's requirements

1. A new bridge is to be installed offshore, linking an existing processing platform with a new living quarters platform. The bridge is to be 50.0m long, as shown in Figure 1.
2. The bridge is to be fully enclosed, providing weather protection for a personnel access way and piping and electrical services. The access way is to be 1.5m wide by 2.5m high.
3. It is intended that relative platform lateral movements of +/- 500mm in North-south and East-West directions, due to environmental loads, will be accommodated in the bridge bearing connections at support points S1, S2, S3 and S4, along with a degree of vertical rotation. Support points are to be formed from 0.6m x 0.6m plates, which connect on to specialist bearing connections.
4. The bridge is to be transported to the offshore site by barge and lifted into place by a single crane lift vessel.

Imposed loading

5. Access way live load. 5.0kN/m² (for personnel access only).
6. Pipes: 8 number 320mm diameter pipes at 1kN/m length operating weight each.
7. Cable racks: 6 number 500mm wide x 150mm high racks at 0.5kN/m length each.
8. The basic wind speed is 60m/sec. based on a 3-second gust. The equivalent mean hourly wind speed is 30m/sec.

Omit from consideration

Fatigue calculations.

SECTION 1

(60 Marks)

Prepare a design appraisal with appropriate sketches indicating two distinct and viable solutions for the proposed bridge structure. Indicate clearly the functional framing, load transfer and stability aspects of each scheme for the relevant temporary and permanent design cases. Recommend one solution, to be developed in the next section.

SECTION 2

(40 Marks)

For the recommended solution prepare sufficient design calculations to establish the form and size of all principal structural elements. Include design sketches of the bridge structure, sufficient for estimating purposes and CAD drafting.

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