Information for registered centres

The seal on this examination paper must only be broken by the candidate at the time of the examination. Under no circumstances should a candidate use an unsealed examination paper.

Information for candidates

Under no circumstances should you, the candidate, use an unsealed examination paper. This examination consists of 20 multiple-choice, and 6 short-answer questions. The exam is worth 40 marks, with a Pass being 24 marks, Merit 28 marks, and Distinction 32 marks. The duration of this examination is 60 minutes.

You are NOT allowed any assistance to complete the answers. You must use a pencil to complete the answer sheet - pens must NOT be used. When completed, please leave the examination answer sheet (EAS) on the desk.

EXAMINATION ANSWER SHEET (EAS) INSTRUCTIONS:
For each question, fill in ONE answer ONLY. If you make a mistake, ensure you erase it thoroughly. You must mark your choice of answer by shading in ONE answer circle only. Please mark each choice like this:

01 A B C D ANSWER COMPLETED CORRECTLY

Examples of how NOT to mark your examination answer sheet (EAS). These will not be recorded.

01 A B C D DO NOT partially shade the answer circle
01 A B C D ANSWER COMPLETED INCORRECTLY
01 A B C X DO NOT use ticks or crosses
01 A B C D ANSWER COMPLETED INCORRECTLY
01 A B C D DO NOT use circles
01 A B C D ANSWER COMPLETED INCORRECTLY
01 A B C DO NOT shade over more than one answer circle
01 A B C ANSWER COMPLETED INCORRECTLY

EXAMINATION ANSWER BOOKLET INSTRUCTIONS
Please carefully read the examination questions and clearly write your answers in the Examination Answer Booklet provided.

All candidates MUST sign the Examination Answer Sheet (EAS) in the bottom right-hand corner of the page before leaving the examination room.
1. A positive social impact of civil engineering activities that is related to high-speed rail is:
   A. the compulsory purchase of properties on the route of the railway
   B. relocation or closure of shared community areas to facilitate the project
   C. linking the north to the south with faster journey times
   D. the economic costs of linking the north to the south

2. Who is responsible for the erection, inspection, supervision and the dismantling of temporary works?
   A. The temporary works designer
   B. The temporary works co-ordinator
   C. The project engineer
   D. The general foreman

3. A ground improvement technique is required for a stretch of a high-speed rail line. The most appropriate methods to use are:
   A. dynamic consolidation and vibro-replacement
   B. vibro-compaction and vibro-displacement
   C. dynamic consolidation and vibro-replacement
   D. lime stabilisation and soil nailing

4. Under the government guidelines, how many steps are there for the application process for a Nationally Significant Infrastructure Project (NSIP) under the development consent regime, such as the HS2?
   A. Four
   B. Five
   C. Six
   D. Eight

5. In a modern prefabricating facility for precast concrete products, a quality audit process is required to be carried out. The process does not include:
   A. observing factory personnel and the work process
   B. interviewing site personnel
   C. examining documents and reports
   D. implementing corrective measures in processes and defects in products

6. The Construction (Design and Management) Regulations 2015 (CDM) are most concerned with:
   A. improving the overall health, safety and welfare of those working in construction
   B. sourcing a greater variety of materials that will improve efficiency
   C. ensuring fair levels of pay for workers on construction sites
   D. ensuring that all projects are completed to the originally stated schedule
7 The most important group civil engineering components constructed to support the track of a high-speed rail project are:

A. roads, paths, foot bridges and screening
B. bridges, tunnels, cuttings and embankments
C. track, catenary, substations and signalling
D. stations, offices, operation and maintenance depots

8 Bridges and viaducts are an integral part of most high-speed rail civil engineering projects. The main reason for this is because:

A. the design and construction cost of bridges and viaducts is relatively low, compared to the costs of embankments and cuttings
B. UK legislation requires that a proportion of the full length of a high-speed railway must be built over bridges and viaducts
C. the restrictive alignment requirements (horizontal and vertical) in high-speed rail projects necessitates the construction of bridges and viaducts
D. the extensive use of bridges and viaducts improves the visual impact of the high-speed rail project and reduces the need to construct tunnels

9 The key difference between quality assurance and quality control is that:

A. quality assurance is less effective than quality control
B. quality assurance detects faults, whereas effective quality control prevents faults
C. quality assurance mainly focuses on the process, while quality control focuses on the product
D. quality assurance detects risks and quality control eliminates them

10 Which organisation would least likely need to be contacted if a new road had to be constructed to facilitate the building of a new railway in England?

A. The Environment Agency
B. The local authority where the road is needed
C. Highways England
D. The UK central government

11 A trench box must be designed by a:

A. construction worker
B. machinist
C. registered professional engineer
D. certified welder

12 Which of the following is not a social sustainability criteria for civil engineering activities?

A. Safety provisions in the work place
B. Open communication amongst all stakeholders
C. Monitoring actual environmental impact on the community
D. Using new tendering and materials procurement processes

13 Which of the following is not included as a requirement within the Construction (Design and Management) Regulations?

A. Pre-construction information
B. The construction phase health and safety plan
C. The accident book
D. The health and safety file
14 The **most** common purpose of rebar in civil engineering concrete structures is to:

A. increase the compressive strength of the structures  
B. to make concrete structures heavier in weight  
C. to make concrete structures lighter in weight  
D. increase the tensile strength of the structures

15 Due to spatial restrictions and environmental concerns, a high-speed line is required to tunnel through a soft rock. The **most** suitable tunnelling technique for this situation is:

A. a tunnel boring machine  
B. drilling and blasting  
C. tunnel jacking  
D. the cut and cover technique

16 A negative environmental impact of engineering activities when constructing a high-speed railway is that:

A. there are increased costs due to the specialist parts required for a high-speed railway line  
B. areas of ancient woodland are cleared for the project  
C. more energy is used by trains on high-speed electric railways  
D. CO2 emissions are increased by high-speed electric railways

17 The planning inspectorate uses 28 days to decide if an application for an NSIP should be allowed. If refused, an applicant can appeal the decision for:

A. 4 weeks  
B. 6 weeks  
C. 20 working days  
D. 1 month

18 The struts in a double-sided support system on temporary works in excavation are subjected to a:

A. bending moment  
B. tensile force  
C. shear force  
D. compressive force

19 A **primary** engineering design consideration for tunnels is that they need to be:

A. large enough to allow 2 trains to pass each other without wasting space  
B. large enough to allow maintenance vehicles to drive through when required  
C. large enough to allow trains to pass without causing aerodynamic disturbance  
D. small enough to use as little building materials as possible

20 Which of the following is **not** a result of lean thinking within construction processes?

A. Faster construction times  
B. Lower material waste  
C. Continuous improvements to the process, workflows and product  
D. Variation of product quality and rate of work
Short Answer Questions

21
Civil engineering software is an important tool to be used in the design of high-speed railways. Describe BIM technology.

(4 marks)

22
Identify software that may be used in the building of a civil engineering project using BIM.

(3 marks)

23
Explain why BIM technology is used instead of traditional building methods.

(3 marks)

24
Drainage is an important factor to consider when designing and constructing a high-speed railway. Explain why it is important to calculate estimated rainwater flow for the construction of drainage for high-speed railway embankments.

(3 marks)

25
Explain how drainage storage volumes are connected to the water flow.

(3 marks)

26
Explain how vegetation is important to drainage design.

(4 marks)