

Level 3 Advanced Technical Diploma in Constructing the Built Environment (540)

(6720-35)

February 2016 Version 1.0

Sample Theory Exam

Answer **all** questions.

1 State **two** forms of foundation that can be used in the construction of low-rise domestic buildings. (2 marks)

2 Explain why the following are requirements of a cold water supply entering a building.

a) The service pipe must enter the building at a minimum depth of 750 mm below ground level. (2 marks)

b) The service pipe must enter the building through the wall but not below the foundation. (2 marks)

3 State **two** benefits of off-site prefabrication in modern methods of construction. (2 marks)

4 Explain the physical and chemical properties of steel that make it an appropriate structural material for use in medium-rise industrial buildings. (6 marks)

5 State **two** items of information that should be collected during a site investigation. (2 marks)

6 State **three** hazards associated with deep excavations. (3 marks)

7 Failure to comply with health and safety legislation in the workplace can have corporate and human consequences.

a) State **three** corporate consequences: (3 marks)

b) State **two** human consequences:

(2 marks)

8 Explain **two** techniques used to supervise and control the workforce on a construction site.

(4 marks)

9 State the personal attributes and skills required of an effective site supervisor.

(5 marks)

10 State the factors that would affect the magnitude of the voltage produced in an electrical generator.

(3 marks)

13 State the **three** forms of surveying traverse. (3 marks)

14 Describe the process used to set out a large radius horizontal curve. (5 marks)

15 Explain a **common** source of land contamination. (2 marks)

16 Explain how the costs associated with the disposal of on-site construction materials can be minimised. (6 marks)

17 You have recently made two purchases from a local building materials supplier. In the first purchase you paid £3000 for 3000 bricks and 1000 blocks. In the second purchase you paid £7000 for 5000 bricks and 3000 blocks. (5 marks)

Value Added Tax (VAT) and delivery costs can be ignored in both cases.

How much would you expect to pay for 2000 bricks and 2000 blocks, if the prices have not changed? Show all working.

18 a) When can the sine rule be used to determine the missing angles and/or sides in a triangle? (2 marks)

b) A sample of ten bricks has lengths of 211, 215, 217, 210, 214, 215, 216 and 218 mm. A figure of 214.4 mm is given as an 'average'. What type of average is this? (1 mark)

Marking guide

Q		Marks	Reference
1	<p>One mark each for any two of the following:</p> <ul style="list-style-type: none"> • Strip (allow deep strip and wide strip). • Raft. • Pile. • Pad and beam (allow 'pad' on its own, but not 'beam'). <p>A clear and accurate sketch is acceptable but it must be identified correctly.</p>	(2 x 1)	301.1.1 A02
2 (a)	At 750 mm below ground level the temperature is constantly above 0°C (1). This ensures that the cold water supply does not freeze (1).	2	301.1.1 A02
(b)	The service pipe does not suffer from ground movement below the foundation (1) and does not have to support the load of the wall and foundation (1).	2	301.1.1 A02
3	<p>One mark each for any two of the following:</p> <ul style="list-style-type: none"> • Better quality control. • Shorter build times. • Reduced labour requirement. • Reduced waste. 	(2 x 1)	301.2.2 A01
4	<p>One mark for identification of property and one mark for brief explanation to a maximum of 6 marks.</p> <ul style="list-style-type: none"> • High strength in compression, tension, bending and shear (1) better than nearly everything else, certainly at the price (1) • High stiffness (1) therefore limited deformation under load (1) • Can be welded (1) not like some metals (1) • Readily available (1) but depends on country/state of market (1) • Reasonably priced (1) compared to many other metals (1) • Allows for higher-rise buildings (1) due to strength and stiffness (1) 	(6)	302.1.3 A02
5	<p>One mark for any two of following:</p> <ul style="list-style-type: none"> • Site boundaries • Access to site • Local roads • Trees, hedges and fences • Topography • Existing structures • Position of existing services • Wildlife and habitat 	(2 x 1)	302.2.1 A01

6	<p>One mark each for any three of the following:</p> <ul style="list-style-type: none"> • Slips, trips and falls. • Hazardous materials. • Use of electricity. • Falling objects. • Negligence and/or tiredness. • Weather conditions. • Hygiene and site housekeeping. • Manual handling. • Working in confined spaces. • On-site traffic. 	(3 x 1)	303.1.2 AO1
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Q		Marks	Reference
7 (a)	<p>Any three of the following (one mark each):</p> <ul style="list-style-type: none"> • HSE investigation. • Improvement notice. • Prohibition notice. • Fines. • Imprisonment. • Confiscation of equipment. • Seizure of assets. • Reputational damage. • Contractual implications. • Stoppage of work. 	(3 x 1)	303.3.2 AO2
(b)	<p>Any two of the following (one mark each):</p> <ul style="list-style-type: none"> • Death or injury (whichever the outcome is). • Emotional impact (on family, friends and co-workers). • Loss of income (on family). 	(2 x 1)	303.3.2 AO2
8	<p>One mark for identification and one mark for brief explanation of the nature of the supervision/control of any two of the following:</p> <ul style="list-style-type: none"> • Bonuses (enhanced pay for enhanced work). • Incentives (for meeting agreed targets). • Meetings (collective responsibility/transmit information). • Toolbox talks (to fulfil H&S requirements and improve safety). • Rules and regulations (from government and PSRBs). • Contracts (legally binding). • Spot-checks (of quality of work, attendance, commitment). 	(2 x 2)	304.1.2 AO2
9	<p>One mark each for any of the following up to maximum of five marks:</p> <ul style="list-style-type: none"> • Technical knowledge. • Interpersonal. • Communication. • Negotiation. • Organisational and planning. • Motivational. 	(5x 1)	304.2.2 AO1

10	<p>One mark each for stating that an increase (or decrease) in any three of the following factors will increase (or decrease) the voltage generated.</p> <ul style="list-style-type: none"> • Strength of magnetic field. • Number of turns in the coil. • Cross-sectional area of the coil. • Speed of rotation of coil relative to magnet. 	(3 x 1)	305.2.2 A01
11	<p>One mark each for any five of the following:</p> <ul style="list-style-type: none"> • The following are caused by water/moisture (1) <ul style="list-style-type: none"> • Fungal attack (1) • Insect attack. (1) • Moisture movement (splits, warps, bends etc) (1) • Damage caused by fire (1) • Poor workmanship (1) 	(5 x 1)	305.4.2 A02

Q		Marks	Reference
12 (a)	<p>One mark each for any two of the following:</p> <ul style="list-style-type: none"> • functional unit method • superficial method • approximate quantities • elemental cost planning 	(2 x 1)	306.2.1 A01
(b)	<p>Descriptions provided incorporating the following:</p> <p>Traditional tendering is when the design process is separate from the construction (1) and full documentation must be supplied by the client before the contractor can be invited to tender for carrying out the work (1).</p> <p>Negotiated tendering is when the client approaches a single supplier (1) based on their track-record or a previous relationship and the terms of the contract are then negotiated (1).</p> <p>Open tendering allows anyone to submit a tender to supply the goods or services that are required (1). Generally an advert will be placed giving notice that the contract is being tendered, offering an equal opportunity to any organisation to submit a tender (1).</p>	(3 x 2)	306.3.2 A02
13	<p>One mark each for the following three forms of traverse.</p> <ul style="list-style-type: none"> • Open • Closed • Link 	(3 x 1)	307.1.1 A01
14	<p>Process to mention the following steps in the appropriate order.</p> <ul style="list-style-type: none"> • Locate intersection points (1) • Locate tangent points (1) • Determine chainage (1) • Determine tangential angle (1) • Calculate long chord (1) <p>Process will not work if not in the correct order. One mark for every step in the correct order.</p>	(5 x 1)	307.1.4 A02

15	<p>One mark for a common source and one mark for explanation.</p> <ul style="list-style-type: none"> • Humans (1) who cause pollution, of all kinds, indirectly (1) • Agricultural sources (1) through use of fertilizers, pesticides, fungicides (1) • Industrial (1) for example buried/dumped waste, or liquid wastes that filter into soil (1) • Communities (1) for example sewage treatment, or land-fill, or detergents in ground (1). 	(2 x 1)	317.2.1 AO1
16	<p>Answer to include reference to up to six of the following. Less waste means less to have to dispose of (and pay for the privilege) (1) for example 'land-fill tax' (1) as well as more effective use of resources so less expense there (1). Standard techniques involve the 3Rs (of which there are actually four) – Reduce (1), Reclaim (1), Reuse (1), Recycle (1) – one mark each if the concept is clearly explained.</p>	(6 x 1)	317.3.3 AO2
17	<p>Dividing everything by 1000, we get: $3x + y = 3$ and $5x + 3y = 7$ (or $3y = 7 - 5x$) Therefore, $y = 3 - 3x$ and $3(3 - 3x) = 7 - 5x$ Therefore, $9 - 9x = 7 - 5x$ and $4x = 2$, so $x = 0.5$ or £500 By substitution, $y = 3 - (3 \times 0.5) = 3 - 1.5 = 1.5$ or £1500 It follows that 2000 bricks and 200 blocks will cost $(2 \times 500) + (2 \times 1500)$ Which equals $£1000 + £3000 = £4000$.</p>	(1) (1) (1) (1) (1)	319.1.3 AO1/ AO2
18 (a)	<p>One mark for each of: When given two sides (1) and an angle opposite to one of the two sides (1).</p>	(2x1)	319.2.3 AO2
(b)	Mean.	1	319.4.2 AO2

Q	Marks	Reference
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<p>19</p>	<p>1-3 marks: Limited response which confirmed the reason was because of the contaminated land, but did not make the link with the probable ongoing use of the land, and has only provided a limited list of the pollutants that may be present. Suggested only one option open to the developer and has discussed it in limited detail.</p> <p>To access marks at the top of the band the advantages and disadvantages of the selected option will be discussed.</p> <p>4-6 marks: Confirmed the reason was because of the contaminated land and has made a tenuous link with the use of the land for housing. They have provided a reasonable list of the contaminants that may be present. They have suggested options open to the developer and have discussed them in reasonable detail.</p> <p>To access marks at the top of the band advantages and disadvantages of the options will have been discussed in terms of both cost and efficacy.</p> <p>7-9 marks: Confirmed the reason was because of the contaminated land and discussed a range of common contaminants. They made the link between contaminated and and unsuitability for residential use and planning departments cannot allow. A range of relevant options discussed in detail with advantages and disadvantages correctly explained. The overall treatment is in-depth and comprehensive.</p> <p>To access marks at the top of the band the response will include relevant justified recommendations.</p> <p>Indicative content:</p> <p>Types of contaminations from heavy industry</p> <ul style="list-style-type: none"> • Asbestos • Heavy metals • Solvents • Oils • Coal dust <p>Impacts of and restrictions due to contaminations</p> <ul style="list-style-type: none"> • Ongoing use of land (eg gardens, play areas) • Remedies <p>Types of other developments</p> <ul style="list-style-type: none"> • Commercial (eg Retail) • Industrial <p>Planning requirements</p>	<p>9</p>	<p>Integration:</p> <p>301.1.1, 302.1.1, 302.2.1, 302.2.2, 303.2.1, 317.2.1</p> <p>A01/ A02/ A04</p>
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Q		Marks	Reference
20	<p>1-3 marks: Specified a limited range of modern methods of construction and modern materials, but with no confidence, and used no logic to support their specifications. The concept of 'embedded energy' is loosely defined and one or two methods of improving things in this area are offered, but with no clear link to the environmental goals. Proposal to dewater the car park but little detail to support the method proposed.</p> <p>To access marks at the top of the band the response will include an accurate comparison of the limited range of methods and/or materials.</p> <p>4-6 marks: Specified an effective range of modern methods of construction and modern materials, and used a broadly sensible approach to the subject. The concept of 'embedded energy' is clearly defined and several clear and accurate suggestions as to what should be done are made. There is however limited or no clear link with the environmental goals. A sensible proposal to dewater the car park, supported by details of the method proposed.</p> <p>To access marks at the top of the band the response will include the advantages and disadvantages of the range of methods and materials.</p> <p>7-9 marks: Specified a comprehensive range of modern methods of construction and materials confidently. The concept of 'embedded energy' is clearly and accurately defined and supported by a comprehensive range of effective strategies designed to achieve the environmental objectives. Fit-for-purpose techniques have been proposed to address the issue of the water table.</p> <p>To access marks at the top of the band the response will include the advantages and disadvantages of the methods and materials, with relevant recommendations made that are supported.</p> <p>Indicative content: Treatments for high water tables Properties and suitability of materials Methods for the conversion</p>	9	Integration: 301.1.3, 301.3.2, 302.1.1, 302.1.3, 303.4.2, 304.3.2, 305.3.2, 317.4.1 AO1/ AO2/ AO4