Use GOLD DRAGON COIN instead of rupees

ROUND 1

Greetings! The **Mother of Dragons**, Queen Daenerys, wants you to help her construct the Dragon Pit (castle) for her dragons. As a result, Jon Snow decided to help her find the perfect plot of land for her castle and thus, sent scholars from all over the country to find the perfect plot. The scholars came to you and now need your help.

Read the descriptions below and find the **best suited** soil for the castle.

You will be asked questions and based on the number of questions you answer in this round you will be allotted a land type.

Questions on EQ/IQ , gen amp

No of questions: 25

(hard 10/ easy 15)

Judging criteria / per question 100 points per hard question and 50 per easy question

MAX JP 1750

|  |  |  |  |
| --- | --- | --- | --- |
| No of questions answered | Soil type | Description |  |
| * 85% | Alluvial soils | Alluvial soils are compressible when loaded. Deep alluvial soils influence the performance of land, infrastructure, and buildings during strong earthquakes in two profound ways. They amplify the shaking and seismic forces for some structures, while for others they reduce or de-amplify the shaking. |  |
| * 56-84% | Laterite | Laterite soil is sometimes referred to as brick earth based on its use. The use of laterite and lateritic soils have been found to promote the realization of decent housing and bridging the housing deficit. Lateritic soils have been described as highly weathered tropical residual soils with varying proportions of particle sizes ranging from clay size to gravel. |  |
| * 31-55% | Black Soil | Black soil is soil which has a tendency to shrink and swell excessively. When these type of soil come in contact with water, they swell and when becomes dry, it shrinks. This alternate process of swelling and shrinking results in the differential settlement of foundation which in turn causes cracks in building. The cracks thus formed are sometimes 15 to 20 cm. The property of volumetric changes with the change of atmospheric conditions makes black cotton soil dangerous to be founded buildings. |  |
| * 00-30% | Mountain soil | Mountain soils are mainly found in Jammu and Kashmir, The Himalayas, These soils are heterogeneous in nature and their character changes with parent rocks and climate. These are sandy loam to loamy. Loam is great for supporting foundations because of its evenly balanced properties and have 32-41% water holding capacity. |  |

Congratulations! You have found the best suited soil for her dream castle! The Queen was indeed pleased and now wants you to decide the perfect architect for the job.

ROUND 2

Choose an architect to plan the Dragon Pit from the following options:

Questions on architecture, town planning ,etc

Questions -20 (5 civil,15 iq )

Ponits per question :

IQ : Easy(4 questions- 1 lakh per question ) medium(6 questions -2 lakh per question ) hard(5 hard – 4 lakh per question )

Civil : 5 questions – 2.8 lakh per question

Maximum Points (For judging ) : 4000

Maximum prize/cash: 50 lakh

|  |  |  |  |
| --- | --- | --- | --- |
| Architect | Description | Price | Judging Points |
| Green Design Architect | Green architecture, or green design, is an approach to building that minimizes harmful effects on human health and the environment. Green architect attempts to safeguard air, water and earth by choosing eco-friendly building materials and construction practices. They continuously work on innovating effective green design methods that leave a minimal impact on the environment. These architects should be knowledgeable in fields like aerodynamics, sun and shading, as well as properties of materials. | 30 Lakh | 3000 |
| Commercial Architect | Commercial architects are licensed professionals that design buildings and structures for non-residential use such as retail and office buildings. They apply artistic, construction and engineering skills to design a variety of commercial buildings and structures. They basically meet the requirements of the client and manage their budget. . | 22 Lakh | 1500 |
| Urban Designer | Urban design is the process of shaping the physical setting for life in cities, towns and villages. It is art of making places. Urban design blends architecture, landscape architecture, and city planning together to make urban areas functional and attractive.They bring human interaction with the environment. Urban design can help make towns and cities safer and more secure. It also incorporates environmental aspects in design. | 40 Lakh | 4000 |

Congratulations your architect has provided you with a blueprint of the castle.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*rapid fire round\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

SCENARIO: Queen Deanery has proposed a new legislation that makes it mandatory to make eco-friendly structures in Winterfell.

Case1: Green design architect and urban designer: the architect has already considered the environmental aspects. We don’t need to redesign.

Case 2: Commercial architecture: you will have to pay Rs. 10 lakh to another architect to make necessary changes.

ROUND 3

Geotechnical and surveying

Now we move on to the next stage, where you need to consult a geotechnical engineer who will make sure that the castle is safe from the north winds, winter, stability of the castle on the hills, provide strong foundation to the castle etc. and a surveyor who will mark the boundaries of the walls of castle.

Questions on geotechnical engineer, surveying

Questions (20)

IQ : 15

CIVIL : 5

Ponits per question :

IQ : Easy(4 questions- 75 thousand per question ) medium(6 questions -1.25 lakh per question ) hard(5 hard – 2.25 lakh per question )

Civil : 5 questions – 1.65 lakh per question

Maximum Points (For judging ) : 4000 + 4000

Maximum prize/cash: 30 lakh

The geotechnical engineer does the testing on soil based on one of the following methods..

|  |  |  |  |
| --- | --- | --- | --- |
| Geotechnical engineering methods | Description | Price | JP |
| Test Pits | Test pits are much like you would expect, a pit is dug either manually or with an excavator in order to reveal the sub-surface conditions to the depth desired. | 6 Lakh | 1300 |
| Trenching | Trenching is similar to Test pits except that in this case, the pit is elongated over some distance in order to establish how the sub-surface conditions change over various parts of the work site. A range of soil samplers can be used to extract test samples including shovels, hand-driven augers, split-spoon samplers, modified California samplers and Shelby tube samplers. | 8 Lakh | 3000 |
| In-Situ Testing | In-situ (in the situation, or at site) testing methods include penetration tests such as Standard Penetration Tests (SPT), which penetrate via drilling, and various Cone Penetration Tests, which penetrate via direct push. These tests measure the physical properties of the subsurface soil directly, without removal. This provides the advantages of generating a more accurate reflection of conditions underground as well as avoiding the necessity of sending samples out for lab testing. | 12 Lakh | 4000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Surveyor | Description | Price |  |
| A | He will use all the modern equipment like Electronic Distance Measurement (EDM), Total station providing utmost accuracy with better decision making, computing & data processing | 10 Lakh | 4000 |
| B | He will use equipment which will provide moderate degree of accuracy | 7 Lakh | 3000 |
| C | He will use equipment which will provide optimum degree of accuracy, poor decision making, fluctuating data collection and poor mapping. | 4 Lakh | 1000 |

SCNERIO:

After you choose the soil type based land. But later in the soil test report you got to know that the soil strength is below the required value. What would you do ?

Option 1: Replace the poor soil. (Rs. 1.3 Lakh, JP 550)

In this method the poor soil is first removed and then the gap is filled up by superior material such as sand, stone, gravel or any other hard material. In order to do this, first excavate a foundation trench of about 1.5 m deep, and then fill the hard material is stages of 30 cm. Then compact the hard material at every stage.

Option 2: Stabilize the soil with chemicals. ( Rs 4 lakh, JP 1000)

This method of improving bearing capacity of soil is costly and applied in exceptional cases. In this method, chemical solutions, like silicates of soda and calcium chloride is injected with pressure into the soil. These chemical along with the soil particles form a gel like structure and develop a compact mass. This is called chemical stabilization of soil and used to give additional strength to soft soils at deeper depths.

Option 3: Compact the soil. (Rs. 50,000 , JP 200)

If we compact soil using appropriate method, then there will be increase in its density and shear strength. As a result the bearing capacity of soil also increases. There are many methods of compacting soils on site. Few of them are mentioned below.

* By spreading broken stones, gravel or sand and thereafter ramming well in the bed of trenches.
* Using an appropriate roller as per the soil type to move at a specified speed.

Option 4: Leave the soil as it is. (Rs. 0, JP 0)

ROUND 4

Excavation

Questions (20)

IQ : 15

CIVIL : 5

Ponits per question :

IQ : Easy(4 questions- 75 thousand per question ) medium(6 questions -1.25 lakh per question ) hard(5 hard – 2.25 lakh per question )

Civil : 5 questions – 1.65 lakh per question

Maximum Points (For judging ) : 4000

Maximum prize/cash: 30 lakh

“Start digging!”, said Tyrion Lannister.

Needless to say, we move on to the next stage of construction, excavating the land.

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Description | Cost |  |
| Manual ( Labor + Machinery) | Here you have to purchase your labour and machinery on rent.  The type of machinery and labour are as follows   |  |  |  |  | | --- | --- | --- | --- | | JP | Machinery | Time | Price | | 3200 | All modern machinery | 7 days | 15Lac | | 2000 | Medium quality machinery | 15 days | 10 Lac | | 1000 | Wretched quality machinery | 30 days | 7 Lac | |  |  |  |  | |  |  |
| Contract | 25 Lac – 5 days | 4000 |  |
|  |  |  |  |

SCNERIO: Due to some issues with some of the machines, the work has been delayed and you have to pay for the extra cost and maintenance of the equipment

CASE 1: Modern Machinery: 1 day – 1.75 lac

CASE 2: Medium Quality Machinery – 5 days – 3.25 lac

CASE 3: Wretched quality machinery – 10 days – 6.5 lac

Case 4: Contract: No delay

ROUND 5

Foundation

Wow! That was tough. Good thing, the excavation is complete. Let’s work on foundation of the castle, the most important part (dragons are heavy after all).Choose the type of foundation you want to construct. Please choose the foundation based on the soil type you have.

Questions on foundation

Questions (20)

IQ : 15

CIVIL : 5

Ponits per question :

IQ : Easy(4 questions- 2.5 lakh per question ) medium(6 questions -4 lakh per question ) hard(5 hard – 7 lakh per question )

Civil : 5 questions – 6.2 lakh per question

Maximum Points (For judging ) : 4000, if as per as land otherwise 1000

Maximum prize/cash: 100 lakh

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Description | Cost |  |
| Pile Foundation | Piles are structural members that are made of steel, concrete, and/or timber.  When the upper soil layer(s) is (are) highly compressible and too weak to support  the load transmitted by the superstructure, piles are used to transmit the load to  underlying bedrocks or a stronger soil layer. | 80 | Alluvial soil |
| Continuous stone masonry foundation | The craft of stonemasonry (or stone craft) has existed since humanity could use and  make tools creating buildings, structures, and sculpture using stone from the earth. The  construction of stones bonded together with mortar is termed as stone masonry where the stones are available in a abundance in nature, on cutting and dressing to the proper shape. | 70 | Mountain soil |
| Strip Foundation | **Strip foundations** are used where the soil is of good bearing capacity. The key sizes of a **strip foundation** for concrete cavity wall construction and timber frame cavity wall construction are similar. The size and position of the **strip** is directly related to the overall width of the wall. Strip foundation protection should be made around external walls with its slope away from the wall so that the moisture does not penetrate the foundation during rainy season. | 75 | Black soil |
| Raft Foundation | **Raft foundations** (sometimes known as Mat **Foundations**) are a large concrete slab which can support a number of columns and walls. The slab is spread out under the entire building or at least a large part of it which lowers the contact pressure compared to the traditionally used strip or trench footings | 84 Lakh | Laterite |

SCNERIO: Heavy snowstorm has hindered its progress and postponing the deadline will be inconvenient for the workers. You have been advised by one of the chief-masons to reduce the number of days taken for the foundation process. What will be your course of action?

a) Reduce the number of days taken for foundation by increasing the number of workers (Rs. 3 lakh ,JP-1000)

b) Wait for the snowstorm to pass ( Rs. 0 ,JP 100 )

ROUND 6

MIX DESIGN

Max cost in this round : 12.77 crore

Min cost in this round : 8.8 crore

Assume king will double everything you own in this round,

Then

Max cost =6.4 cr

Min cost =4.4 cr

Total number of Questions: 25

Gen IQ/ Amp = 20 (5 easy- 13 lakh per question, 10- medium-26 lakh per question, 5 – hard, 53 lakh per question)

Civil = 5 questions ( 30 lakh per question)

Max prize; 7.4 crore

For mix proportion all we need is a pinch of cement, course aggregate, fine aggregate and a drop of water(not really a drop or pinch) , and poof, here is our castle! Actually, mix proportion is the quantity of materials required to prepare concrete of required strength...in our case we need tons of strength. (It’s a castle after all!)

**Mix Design for M40**

**The design is as per IS 10262 : 2009**

**STIPULATIONS FOR PROPORTIONING**

Grade designation: M40

Type of cement: OPC 43 conforming to IS 8112

Maximum nominal size of aggregate: 20 mm

Minimum cement content: 320 kg/m3

Maximum water-cement ratio: 0.45

Workability: 100 mm (slump)

Exposure condition: Severe (for reinforced concrete)

Method of concrete placing: Pumping

Degree of supervision: Good

Type of aggregate: Crushed angular aggregate

Maximum cement content: 450 kg/m3

Chemical admixture type: Superplasticizer

**DATA FOR MATERIALS**

Cement used: OPC 43 conforming to IS 8112

Specific gravity of cement: 3.15

Chemical admixture: Superplasticizer conforming to IS 9103

Specific gravity of:

Coarse aggregate: 2.74

Fine aggregate: 2.74

Water absorption:

Coarse aggregate: 0.5 percent

Fine aggregate: 1.0 percent

**TARGET STRENGTH FOR MIX PROPORTION**

f ‘CK = f CK + 1.65 s

where

f ‘CK = target average compressive strength at 28 days

f CK ==characteristic compressive strength at 28 days

s = standard deviation

From table 1 of IS 10262 : 2009 , standard deviation + 5 N/mm2

Therefore target strength = 40 + 1.65 x 5 = 48.25 N/mm2

SELECTIOM OF WATER-CEMENT RATIO

From table 5 of IS 456, maximum water-cement ratio =0.45

Based on experience, adopt water-cement ratio as 0.40.

As 0.40 < 0.45 , hence OK.

**SELECTION OF WATER CONTENT**

From table 2 of IS 10262 : 2009, maximum water content for 20 mm aggregate = 186 L ( for 25 to 50 mm slump range )

Estimated water content for 100 mm slump = 186 + X 186 = 197 L

As superplasticizer is used, the water content can be reduced up to 30 percent

Based on trails with superplasticizer water content reduction of 29 percent has been achieved. Hence, the arrived water content = 197 x 0.71 = 140 L

**CALCULATION OF CEMENT AND FLY ASH CONTENT**

Water-cement ratio = 0.40

Cementitious material (cement + fly ash) content = = 350 kg/m3

From table 5 of IS 456 , minimum cement content for ‘severe’exposure conditions = 320 kg/m3

350 kg/m3 > 320kg/m3 , Hence , OK.

Now , to proportion a mix containing fly ash the following steps are suggested :

A) Decide the percentage fly ash to be used based on project requirement and quality of materials.

B) In certain situations increase in cementitious material content may be warranted. The decision on increase in cementitious material content and its percentage may be based on experience and trails.

Here, we are considering an increase of 10 percent cementitious material content.

cementitious material content = 350 x 1.10 = 385 kg/m3

Water content =140kg/m3

So, water cement ratio == = 0.364

Fly ash @ 30% of total cementitious material content = 385 x 30% = 115 kg/m3

Cement (OPC) = 385 – 115 = 270 kg/m3

Saving of cement while using fly ash = 350 – 270 = 80 kg/m3

Fly ash being utilized = 115 kg/m3

**PROPORTION OF VOLUME OF COARSE AND FINE AGGREGATE CONTENT**

From table 3 of IS 10262 : 2009, volume of coarse aggreagate corresponding to 20 mm size aggregate and fine aggregate (Zone I) for water cement ratio of 0.50 = 0.60

In present case water cement ratio is 0.40. Therefore, volume of coarse aggregate is required to be increased to derease the fine aggregate content. As, the water cement ratio is lower by 0.10, the proportion of volume of coasre aggreagate is increased by 0.02 (at the rate of -/+ 0.001 for every ± 0.05 change in water-cement ratio). Therefore, corrected proportion of volume of coasre aggregate for the water-cement ratio of 0.40 = 0.62

For pumpable concrete these values should reduced by 10 percent.

Therefore, volume of coarse aggregate = 0.62 x 0.9 = 0.56.

Volume of fine aggregate content = 1-0.56 =0.44

**MIX CALCULATIONS**

The mix calculatioons per unit volume of concrete shall be as follows:

1. Volume of concrete = 1 m3
2. Volume of cement =x

x = 0.086 m3

1. Volume of fly ash =x

x = 0.052 m3

1. Volume of water =x

x = 0.140 m3

1. Volume of chemical admixture ( superplasticizer) @ 2.0% by mass of cementitious material ) =x

x = 0.007 m3

1. Volume of all in aggregate = [a – ( b + c + d + e ) ]

=1- (0.086 + 0.052 + 0.140 + 0.007)

= 0.715 m3

1. Mass of coarse aggregate = f x volume of coarse aggregate x specific gravity of coarse aggregate x 1000

= 0.715 x 0.56 x 2.74 x 1000

= 1097 kg

1. Mass of fine aggregate = f x volume of fine aggregate x specific gravity of fine aggregate x 1000

= 0.715 x 0.44 x 2.74x 1000

= 862 kg

**MIX PRPORTIONS:**

Cement = 270 kg/m3

Fly Ash = 115 kg/m3

Water = 140 kg/m3

Fine aggregate = 862 kg/m3

Coarse aggregate = 1097 kg/m3

Chemical admixture = 7.7 kg/m3

Water cement ratio = 0.364

Now as our structure requires 15,000 m3 of concrete

**Amount of cement required: 4050 tons**

**Amount of fly ash required: 1725 tons**

**Amount of fine aggregate required: 12930 tons**

**Amount of coarse aggregate required: 16455 tons**

**Amount of** chemical admixture **required: 115.5 tons**

**Amount of water required: 2100000 L**

**Total number of trips, considering 60 tons per trips:**

**Cement: 68 trips**

**Fly ash: 29 trips**

**Fine aggregate: 216 trips**

**Coarse aggregate: 275 trips**

Chemical admixture: 2 trips

**For water tanker of capacity: 6000 L**

**Number of trips of water tanker: 350 trips**

Now you have a choice from the following companies:

Westeros & Esssos Co. which is at a distance of 60 miles in King’s Landing

Pentos Limited which is at a distance of 150 miles in Crownlands

Sandline Corporation which is at a distance of 270 miles in Cider Hall.

The cost and quality of various construction materials is :

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| COST (Rs./kg) | Sandline Corporation | Pentos Limited | Westeros & Esssos Co. |  |
| Quality | Best | Moderate | Good |  |
| CEMENT | 10 | 8.5 | 6.7 |  |
| Fine Aggregate | 1.2 | 1 | 0.8 |  |
| Coarse Aggregate (20 mm) | 1.7 | 1.45 | 1.1 |  |
| Fly ash | 2.1 | 1.9 | 1.75 |  |
| Super Plasticizer | 65 | 55 | 47 |  |
|  |
| JP | 3000 per choice | 1750 per choice | 950 per choice |  |

And cost of water per litre is Rs. 1.15

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Sandline Corporation | Pentos Limited | Westeros & Esssos Co. |  |  |  |
| Rate/truck/trip | 11,360 | 8610 | 7350 |  |  |  |

|  |  |
| --- | --- |
| Rate/water tank/trip | 4630 |

|  |  |  |  |
| --- | --- | --- | --- |
| MATERIAL | BEST QUALITY | MODERATE QUALITY | GOOD QUALITY |
| CEMENT | 4,05,00,000 | 3,44,25,000 | 2,71,35,000 |
| FINE AGGREGATE | 1,55,16,000 | 1,29,30,000 | 1,03,44,000 |
| COARSE AGGREGATE | 2,79,73,500 | 2,38,59,750 | 1,81,00,500 |
| Fly ash | 36,22,500 | 32,77,500 | 30,18,750 |
| Super Plasticizer | 75,07,500 | 63,52,500 | 54,28,500 |
| TOTAL | 9,51,19,500 | 8,08,44,750 | 6,40,26,750 |

TRANSPORTATION CHARGES

|  |  |  |  |
| --- | --- | --- | --- |
| MATERIAL | BEST | MODERATE | GOOD |
| CEMENT | 7,72,480 | 5,85,480 | 4,99,800 |
| FINE AGGREGATE | 24,53,760 | 18,59,760 | 15,87,600 |
| COARSE AGGREGATE | 31,24,000 | 23,67,750 | 20,21,250 |
| Chemical admixture | 22,720 | 17,220 | 14,700 |
| **Fly ash** | 3,29,440 | 2,49,690 | 2,13,150 |
| TOTAL | 67,02,400 | 50,79,900 | 43,36,500 |

WATER COST=24,15,000

TRANSPORTATION CHARGES OF WATER= 16,20,500

Total cost =

Scenario 1:

Jon snow started construction work around winterfell. He received all the materials and contacted a person who lived far away from winterfell and hired the workers. The workers are skilled but at the same time they are costlier too and it would take them more time to reach winterfell.

Now, queen deanery offered help to snow at a condition that he has to hire all her people as workers who happens to reside near winterfell .The workers are unskilled but they are bit cheaper.

But snow has already signed the agreement with the person. He is in dilemma about whom to choose: Queen Deanery or the person?

What will you do in this situation?

1: Accept queen’s offer. ( JP – 100, Rs. 1.5 crore )

2: Keep the contract with the person. ( JP- 2500, Rs. 2 Crore )

Scenario 2 :

The negligence of the personnel in charge of the construction towards the safety of the workers resulted in two fatalities. How would you cope with the situation?

Option 1: Bribe the local authorities ( JP 100, Rs. 2 Lakh)

Option 2: Compensate their family ( JP 600, Rs. 8 Lakh )

Option 3: Compensate their family and improve safety standards. (JP 1000 , Rs. 15 Lakh)

Scenario 3:

The reconstruction of the castle requires tons of gallons of water. But the pre-existing water crisis in the city has created unrest among the people living there, leading them to raise their voices against the huge water consumption for the construction. How would you deal with the situation?

1. Ignore the people ( Rs. 0, JP- 0)

2. Share water with people/make arrangements of water for the people as well ( Rs. 3 Lakh, JP 1000 )

3. Stop the construction until the water issue is sorted. ( Rs. 1.75 Lakh, JP 500)