

### **Question 1.**

Define and explain the risk log/register in your own words. Develop a risk log/register for the construction project (you have worked in or you are working). Details of each project must be unique and should be provided accurately to the best of your knowledge. Risk register is attached at the end of the paper (Table 1). Use notes for specifying headings

Construction is a risky business. Each construction project is unique and comes with its own set of challenges and opportunities. Identifying and managing construction project risks can be tricky, but not impossible with careful planning and execution. When a risk turns into reality it can disrupt and derail a project which is why construction risk management is so important. In order to avoid disaster, we need to be able to properly assess, control, and monitor risks once they have been identified.

For proper construction risk management, we need to know the types of risks inherent in construction projects. These can be financial, contractual, operational, and environmental and can be caused by both internal and external sources.

Common risks include in construction projects are:

- Safety hazards that lead to worker accidents and injuries
- Managing change orders / variation orders
- Incomplete drawings and poorly defined scope
- Unknown site conditions
- Poorly written contracts
- Unexpected increases in material costs
- Labor shortages
- Damage or theft to equipment and tools
- Natural disasters
- Issues with subcontractors and suppliers
- Availability of building materials
- Poor project management

One of the most trusted and relied upon documents and mechanisms for understanding and managing construction project risk are risk registers. The risk register outlines each unique risk, describes that risk; describes the impact the risk would have on the project and then scores that risk.

Project Name: Construction of Asil – Targhawo Road in Bajaur tribal district

Project Manager: Jalil ur Rehman

ID	Date raised	Risk description	Risk			Without controls			Controls	Residual risk	Action
			H	M	L	Cost impact	Time impact	Other			
[No.]	[Date mm/dd/yyyy]	[There is a risk that.... If this happens... ..]	[tick or enter Y]	[tick or enter Y]	[tick or enter Y]	[The cost if the risk occurs e.g. x man days]	[The time impact if the risk occurs e.g. x days delay]	[Anything else that would happen e.g. lost reputation]	[Actions that will be taken to reduce the impact of the risk]	[Any risks that remain once the controls are in place]	[Document any actions to be taken to implement controls or manage residual risks]
1	June 10, 2019	If the land acquisition cannot be completed on time	H			10% of the total project cost	90 days delays may occur	The project may cancel	Land acquisition must be started immediately after approval of PC-1	Local people may create hurdle during construction even after land acquisition completed	Funds approved for land acquisition
2	August 15, 2019	Difference in earthwork quantities		M		Construction cost will increase	Delay will occur if timely decision is not taken	No	Variation order needs to be prepared and to be approved as soon as possible	No	Process defined for Variation orders
3	November 10, 2019	Retaining wall design not according to site condition			L	Construction cost will increase	No delay	No	New design as per site condition needs to be provided	No	Design changed as per site conditions
4	January 20, 2020	Non-availability of funds	H			Claims will be submitted by contractors	Delay will occur if payment not made to contractors	Contractor will demobilize from site	Arrangement of funds need to be done	No	Funds to be arranged

[No.]	[Date mm/dd/yyyy]	[There is a risk that.... If this happens... ..]	[tick or enter Y]	[tick or enter Y]	[The cost if the risk occurs e.g. x man days]	[The time impact if the risk occurs e.g. x days delay]	[Anything else that would happen e.g. lost reputation]	[Actions that will be taken to reduce the impact of the risk]	[Any risks that remain once the controls are in place]	[Document any actions to be taken to implement controls or manage residual risks]
8	February 02, 2020	Lack of communication, causing lack of clarity and confusion.		M	No	No	No	Use most appropriate channel of communication. e.g. don't send email to contractors, have a call or in person meeting instead.	No	Line of communication needs to be established between stakeholders
9	March 15, 2020	Acts of God for example, extreme weather, pandemic leads to loss of resources, materials, premises etc.		M	Construction cost will increase due to lockdowns	Delay will occur due to demobilization of contractor from site	No	Contractors would be asked to provide Insurance to its staff and resources	No	
10	April 10, 2020	Theft of materials, intellectual property or equipment.			L NO	NO	NO	Involve District administration for providing security to contractors	NO	Follow security procedures, ensure Non-Disclosure Agreements, & compliance

Discuss how Cost-benefit analysis is effective for a project? Support your arguments with real example.

**There are two main purposes in using Cost Benefit Analysis:**

- Example:** Government of KP is planning to undertake one project. It has two alternatives with the following benefits and costs.

The total Costs for project 1 = Rs.600 million  
Benefits available from project 1 = Rs. 1000 million

The total Costs for project 2 = Rs. 100 million  
Benefits available from project 2 = Rs. 210 million

### Solution

In order to decide which, project the GOKP should opt. using the cost-benefit analysis, the benefit-cost ratio will be calculated for both of the projects.

**Benefit-Cost Ratio = Benefits available from the project / Total cost of the project**

#### **Alternative 1**

The benefit-cost ratio can be calculated as,

Benefits available from the project 1(Rs.1000 million) / Total cost of the project 1(Rs. 600 million)

**Benefit-Cost Ratio = 1.667**

#### **Alternative 2**

The benefit-cost ratio can be calculated as,

Benefits available from the project 2(Rs. 210 million) / Total cost of the project 2(Rs. 100 million)

**Benefit-Cost Ratio = 2.1**

**Analysis:** Being both the projects have positive outcomes, both of the projects are beneficial for the GOKP i.e., the GOKP will be in profit if it undertakes any of the projects. However, as the GOKP has to choose one out of two, the project with a higher benefit-cost ratio will be selected. In the present case, **project 2** has a higher benefit-cost ratio so as per Cost-benefit analysis project 2 should be selected by GOKP.

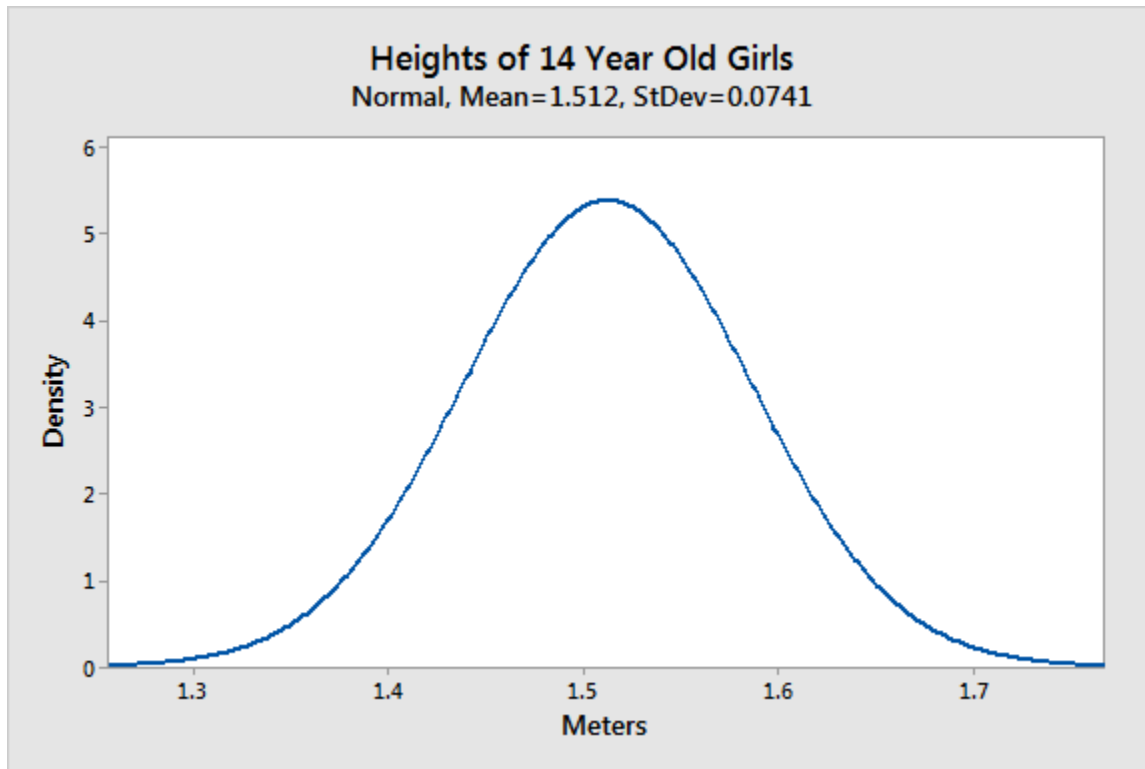
### **Question 3.**

(a) What is Normal Probability distribution?

The Normal Probability distribution is the most important probability distribution in statistics because it fits many natural phenomena. For example, heights, blood pressure, measurement error, and IQ scores follow the normal distribution. The normal probability distribution is a probability function that describes how the values of a variable are distributed. It is a symmetric distribution where most of the observations cluster around the central peak and the probabilities for values further away from the mean taper off equally in both directions. Extreme values in both tails of the distribution are similarly unlikely.

### Example of Normally Probability Distributed Data:

Height data are normally distributed. The distribution in this example fits real data that was collected from 14-year-old girls during a study.



As you can see, the distribution of heights follows the typical pattern for all normal distributions. Most girls are close to the average (1.512 meters). Small differences between an individual's height and the mean occur more frequently than substantial deviations from the mean. The standard deviation is 0.0741m, which indicates the typical distance that individual girls tend to fall from mean height.

The distribution is symmetric. The number of girls shorter than average equals the number of girls taller than average. In both tails of the distribution, extremely short girls occur as infrequently as extremely tall girls.

- (b) Suppose that the data concerning the first-year salaries of employees is normally distributed with the population mean  $\mu = 60000$  PKR and the population standard deviation  $\sigma = 15000$  PKR. Find the probability of a randomly selected employees earning less than 45000 PKR annually. Hint: To answer this question, you have to find the portion of the area under the normal curve from 45 all the way to the left. Find Z-Score table at the end of the paper (Table 2)

From the given information:

First year salaries of employees normally distributed is Rs. 60,000 and the Standard deviation is Rs. 15000

Thus,

$$\mu = 60000$$

$$\sigma = 15000$$

Find the probability of a randomly selected employees earning less than Rs. 45,000

Solution: Let X be the random variable of a salary of employees (in Rs.), then the Z will be calculated as per below formula

$$Z = \frac{X - \mu}{\sigma}$$

$$Z = \frac{45,000 - 60,000}{15000}$$

$$Z = -1$$

Now as per Table 2, when  $Z = -1$ , the Probability of employees earning less than Rs. 45,000 is 0.15866, it means around 15.86% employees will be getting less than Rs. 45,000