**Risk and Disaster Management in Construction**

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**Question No 01**

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.

**Risk log/Register:**

A risk register is a tool in risk management and project management. It is used to identify potential risks in a project or an organization, sometimes to fulfill regulatory compliance but mostly to stay on top of potential issues that can derail intended outcomes. The risk register includes all information about each identified risk, such as the nature of that risk, level of risk, who owns it and what are the mitigation measures in place to respond to it

1) Project purpose and need is not well defined

2) Project design and deliverable definition is incomplete.

3) Project schedule is not clearly defined or understood.

4) No control over staff priorities.

5) Consultant or contractor delays

6) Estimating and scheduling errors.

7) Unplanned work that must be accommodated.

8) Lack of communication, causing lack of clarity and confusion.

9) Pressure to arbitrarily reduce task durations and or run tasks in parallel which would increase risk of errors.

10) Scope creep.

11) Unresolved project conflicts not escalated in a timely manner.

12) Business case becomes obsolete or is undermined by external changes.

13) Delay in earlier project phases jeopardizes ability to meet fixed date. For example delivery of just in time material, for conference or launch date.

14) Added workload or time requirements because of new direction or policy.

15) Inadequate customer testing leads to large post go live snag list.

16) Legal action delays or pauses project.

17) Customer refuses to approve deliverables or milestones or delays approval putting pressure on project manager to work at risk.

18) Theft of materials, intellectual property or equipment.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DATE RAISD | RISK DISCRIPTION | RISK | WITHOUT CONTROL | CONTROLS | RESIDENTIOAL RISK | ACTION |
| HIGH  | MEDIUM | LOW | COST IMPACT | TIME IMPACT | OTHERS |   |   |   |
| Jan-19 | Water profing basement | work at several location | **Y** |  |  | **MANDATORY** | **MENDATORY** |  | **ESSENTIAL** | **LESS LIFE TIME** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| 15-Jan-19 | Building Basement raft | work at several location | **Y** |  |  | **QUALITY INSURANCE** | **LESS TIME** |  | **ESSENTIAL** | **BUILDING STRENGTH** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| 25-Jan-19 | concreting | work at several location | **Y** |  |  | **APPROVED MATERIAL** | **CHEMICAL ADMEXTURE** |  |  | **SATISFACTORY** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| 19-Feb | PROJECT MANAGEMENT | work at several location |  | **Y** |  |  |  | **TEAM MANAGEMENT** |  | **LESS IMPACT** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| - | CRANE OPERATING | work at several location | **Y** |  |  |  |  | **AS PER REQUIRMENT** |  | **HIGH RISK** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| TEMPRARY: START PERMANENT: END | BUILDING WATER TANKS | work at several location |  | **Y** |  |  |  | **MANDATORY** |  | **HIGHLY ESSENTIAL** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| 1-Jan | STEEL TESTING | work at several location |  |  | **Y** |  |  | **QUALITY INSURANCE** |  | **STRUCTURE COLAPSMENT** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| 1-Apr | LIFTS INSTALLING AND OPERATING MULTIPLE LIFTS | work at several location |  |  | **Y** |  | **TIME SAVINGS** |  |  | **MANDATORY** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |
| start-end | OPERATING MULTIPLE RMC PLANTS | work at several location |  | **Y** |  | **COST SAME**  | **TIME SAVING**  | **QUALITY INSURANCE** |  | **-** | invest and facilities for workers and staff |
| inspection and quality control procedure |  |  |  |  |  |  |  |  | provide emergency escape roots |
| night work |  |  |  |  |  |  |  |  | invest and standerd quality of material |
| work during rain |  |  |  |  |  |  |  |  | invest in lightning |
| land slide |  |  |  |  |  |  |  |  | invest in standared equipment |
| braeckdown of equiptment |  |  |  |  |  |  |  |  | enhance staff training and increase supervision  |
| accident |  |  |  |  |  |  |  |  |   |

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**Question No 02**

**What Is a Cost-Benefit Analysis?**

Cost benefit analysis is very important tool for calculating importance of the project before its execution. The financial group of the project are main decisions making party and thus they do consider all the relevant expenses and expenditure during and after the execution. A cost-benefit analysis is a process businesses use to analyze decisions. The business or analyst sums the benefits of a situation or action and then subtracts the costs associated with taking that action. Some consultants or analysts also build models to assign a dollar value on intangible items, such as the benefits and costs associated with living in a certain town. Example

Option 1

Build 200 flats out of which 100 flats will be given on the rent for a period of 10 years at the rent of $ 2,000 per year. After the period of 10 years, the rented 100 flats would be sold out at the price of $ 100,000

On the cost side, the cost of construction would come to $ 110,000 per flat which can be sold at $150,000 each. Apart from the construction cost, the cost of sales and staff would come to $ 700,000 per year. The financing cost of the project would be $1,500,000 and the project would last for 2 years.

Option 2

Build 100 flats out of which 20 flats will be given on the rent for a period of 5 years at the rent of $ 3,000 per year. After the period of 5 years, the rented 20 flats would be sold out at the price of $ 120,000

On the cost side, the cost of construction would come to $ 150,000 per flat which can be sold at $200,000 each. Apart from the construction cost, the cost of sales and staff would come to $ 450,000 per year. The financing cost of the project would be $4,000,000 and the project would last for 1 year.

Analyze the investment options using Cost-benefit analysis.

Option 1

The benefit-cost ratio can be calculated as

|  |
| --- |
| **option 2** |
|   | benefits |   |   |
| a | income from Rentals | 100\*10\*2000 | 2000000 |
| b | income from Sales | 100\*150000 | 15000000 |
| c | income from Sales After rental period | 100\*100000 | 10000000 |
| d | Total Benefit |   | 27000000 |
|   |
| e | Costs |   |   |
| f | Construction Cost | 200\*110000 | 22000000 |
| g | Sales and Staff cost  | 2\*700000 | 1400000 |
| h | Financing cost | 1500000\*2 | 3000000 |
|   | Total Cost |   | 26400000 |
|   |   |   |   |
|   | **COST-BENEFIT RATIO (d/h)** | **1.02** |   |

=27000000 / 26400000

Benefit-Cost Ratio = 1.02

Option 2

The benefit-cost ratio can be calculated as,

|  |
| --- |
| **option 2** |
|   | benefits |   |   |
| a | income from Rentals | 20\*5\*3000 | 300000 |
| b | income from Sales | 80\*200000 | 16000000 |
| c | income from Sales After rental period | 20\*120000 | 2400000 |
| d | Total Benefit |   | 18700000 |
|   |
| e | Costs |   |   |
| f | Construction Cost | 100\*150000 | 15000000 |
| g | Sales and Staff cost  | 2\*450000 | 900000 |
| h | Financing cost | 2000000\*1 | 2000000 |
|   | Total Cost |   | 17900000 |
|   |   |   |   |
|   | **COST-BENEFIT RATIO (d/h)** | **1.04** |   |

=18700000 / 17900000

Benefit-Cost Ratio = 1.04

It is seen the Benefit-cost ratio of option 1 is 1.02 and option 2 is 1.04. When both the options are compared it can be seen that option 2 has a higher benefit to cost ratio and therefore the company should it over option 1.

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**Question No 03**

**Part A**

What is Normal Probability distribution?

**Normal Probability distribution:**

The normal 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.
* The normal 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.
* It is also known as the Gaussian distribution and the bell curve.

**Part B**

Suppose that the data concerning the first-year salaries of employees is normally distributed with the population mean µ = 60000 PKR and the population standard deviation σ = 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)

**Given data :**

* Mean µ = 60000 PKR---------------1
* Standard deviation σ = 15000 PKR------------------2
* X≤45,000-------------------------------------3

**Required data:**

* The portion of the area under the normal curve from 45 all the way to the left?
* Z-Score table at the end of the paper (Table 2)?

**SOLUTION:**

* (m) The natural log of normally distributed with the population mean µ = 60000 PKR  is 11.002
* standard deviation σ = 15000 PKR  is 9.6158 What is the probability of a randomly selected employees earning less than 45000 PKR annually This is a tougher one.
* First let find out what the natural log of 15,000.  Its 9.6158.  Next we need the standard deviation of log income. Its 9.6158.

Now we can form a z score.

Z= (x-u)/-------------------(1)

Put value in equ 1

Z=(10.714-11.002)/9.615

=-.03

What is P(Z=-.03)

From table 2 we have ( .51197)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Z** | **.00** | **.01** | **.02** | **.03** | **.04** | **.05** | **.06** | **.07** | **.08** | **.09** |
| **0.0** | .50000 | .50399 | .50798 | .51197 | .51595 | .51994 | .52392 | .52790 | .53188 | .53586 |
| **0.1** | .53983 | .54380 | .54776 | .55172 | .55567 | .55962 | .56356 | .56749 | .57142 | .57535 |
| **0.2** | .57926 | .58317 | .58706 | .59095 | .59483 | .59871 | .60257 | .60642 | .61026 | .61409 |
| **0.3** | .61791 | .62172 | .62552 | .62930 | .63307 | .63683 | .64058 | .64431 | .64803 | .65173 |
| **0.4** | .65542 | .65910 | .66276 | .66640 | .67003 | .67364 | .67724 | .68082 | .68439 | .68793 |
| **0.5** | .69146 | .69497 | .69847 | .70194 | .70540 | .70884 | .71226 | .71566 | .71904 | .72240 |
| **0.6** | .72575 | .72907 | .73237 | .73565 | .73891 | .74215 | .74537 | .74857 | .75175 | .75490 |
| **0.7** | .75804 | .76115 | .76424 | .76730 | .77035 | .77337 | .77637 | .77935 | .78230 | .78524 |
| **0.8** | .78814 | .79103 | .79389 | .79673 | .79955 | .80234 | .80511 | .80785 | .81057 | .81327 |
| **0.9** | .81594 | .81859 | .82121 | .82381 | .82639 | .82894 | .83147 | .83398 | .83646 | .83891 |
| **1.0** | .84134 | .84375 | .84614 | .84849 | .85083 | .85314 | .85543 | .85769 | .85993 | .86214 |
| **1.1** | .86433 | .86650 | .86864 | .87076 | .87286 | .87493 | .87698 | .87900 | .88100 | .88298 |
| **1.2** | .88493 | .88686 | .88877 | .89065 | .89251 | .89435 | .89617 | .89796 | .89973 | .90147 |
| **1.3** | .90320 | .90490 | .90658 | .90824 | .90988 | .91149 | .91309 | .91466 | .91621 | .91774 |
| **1.4** | .91924 | .92073 | .92220 | .92364 | .92507 | .92647 | .92785 | .92922 | .93056 | .93189 |
| **1.5** | .93319 | .93448 | .93574 | .93699 | .93822 | .93943 | .94062 | .94179 | .94295 | .94408 |
| **1.6** | .94520 | .94630 | .94738 | .94845 | .94950 | .95053 | .95154 | .95254 | .95352 | .95449 |
| **1.7** | .95543 | .95637 | .95728 | .95818 | .95907 | .95994 | .96080 | .96164 | .96246 | .96327 |
| **1.8** | .96407 | .96485 | .96562 | .96638 | .96712 | .96784 | .96856 | .96926 | .96995 | .97062 |
| **1.9** | .97128 | .97193 | .97257 | .97320 | .97381 | .97441 | .97500 | .97558 | .97615 | .97670 |
| **2.0** | .97725 | .97778 | .97831 | .97882 | .97932 | .97982 | .98030 | .98077 | .98124 | .98169 |
| **2.1** | .98214 | .98257 | .98300 | .98341 | .98382 | .98422 | .98461 | .98500 | .98537 | .98574 |
| **2.2** | .98610 | .98645 | .98679 | .98713 | .98745 | .98778 | .98809 | .98840 | .98870 | .98899 |
| **2.3** | .98928 | .98956 | .98983 | .99010 | .99036 | .99061 | .99086 | .99111 | .99134 | .99158 |
| **2.4** | .99180 | .99202 | .99224 | .99245 | .99266 | .99286 | .99305 | .99324 | .99343 | .99361 |
| **2.5** | .99379 | .99396 | .99413 | .99430 | .99446 | .99461 | .99477 | .99492 | .99506 | .99520 |
| **2.6** | .99534 | .99547 | .99560 | .99573 | .99585 | .99598 | .99609 | .99621 | .99632 | .99643 |
| **2.7** | .99653 | .99664 | .99674 | .99683 | .99693 | .99702 | .99711 | .99720 | .99728 | .99736 |
| **2.8** | .99744 | .99752 | .99760 | .99767 | .99774 | .99781 | .99788 | .99795 | .99801 | .99807 |
| **2.9** | .99813 | .99819 | .99825 | .99831 | .99836 | .99841 | .99846 | .99851 | .99856 | .99861 |
| **3.0** | .99865 | .99869 | .99874 | .99878 | .99882 | .99886 | .99889 | .99893 | .99896 | .99900 |
| **3.1** | .99903 | .99906 | .99910 | .99913 | .99916 | .99918 | .99921 | .99924 | .99926 | .99929 |
| **3.2** | .99931 | .99934 | .99936 | .99938 | .99940 | .99942 | .99944 | .99946 | .99948 | .99950 |
| **3.3** | .99952 | .99953 | .99955 | .99957 | .99958 | .99960 | .99961 | .99962 | .99964 | .99965 |
| **3.4** | .99966 | .99968 | .99969 | .99970 | .99971 | .99972 | .99973 | .99974 | .99975 | .99976 |
| **3.5** | .99977 | .99978 | .99978 | .99979 | .99980 | .99981 | .99981 | .99982 | .99983 | .99983 |
| **3.6** | .99984 | .99985 | .99985 | .99986 | .99986 | .99987 | .99987 | .99988 | .99988 | .99989 |
| **3.7** | .99989 | .99990 | .99990 | .99990 | .99991 | .99991 | .99992 | .99992 | .99992 | .99992 |
| **3.8** | .99993 | .99993 | .99993 | .99994 | .99994 | .99994 | .99994 | .99995 | .99995 | .99995 |
| **3.9** | .99995 | .99995 | .99996 | .99996 | .99996 | .99996 | .99996 | .99996 | .99997 | .99997 |

This is Just: 1-P(Z<.03) = 1-F(.03)= 1- .51197=.48803