FINN 372
ACTUARIAL PROJECT

GROUP 1

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Person A

Description: Person A has 1 dependent at the moment, namely his wife who is going on a hiatus to start a family. One year after today, Person A will have another dependent, namely his child. The couple will have a single child only, owing to their financial circumstances and wife's wish to continue her career a few years after the birth of their child. The wife's salary has not been taken into account as it would only be used to cover her personal expenses and savings. In a Pakistani context, Person A wishes to be the sole breadwinner of his family and aims to maintain their lifestyle (including their future expenses) even after his death. He is looking for a policy to cover for the next 10-15 years in case something adverse happens to him.

Current Financial Position

1. Expected Earnings:

For the first year, Person A started working right after graduating with a starting salary of **PKR 74,217** and after yearly increments for 10 years is earning **PKR 175,000** per month. Which comes up to **PKR 2,100,000** per annum. He is working a stable job with a constant annual increment of 10%. He has no intention of quitting his job in the next 15 years at least.

year after grad	monthly salary	yearly salary
10	PKR 175,000.00	PKR 2,100,000.00
11	PKR 192,500.00	PKR 2,310,000.00
12	PKR 211,750.00	PKR 2,541,000.00
13	PKR 232,925.00	PKR 2,795,100.00
14	PKR 256,217.50	PKR 3,074,610.00
15	PKR 281,839.25	PKR 3,382,071.00
16	PKR 310,023.18	PKR 3,720,278.10
17	PKR 341,025.49	PKR 4,092,305.91
18	PKR 375,128.04	PKR 4,501,536.50
19	PKR 412,640.85	PKR 4,951,690.15
20	PKR 453,904.93	PKR 5,446,859.17
21	PKR 499,295.42	PKR 5,991,545.08
22	PKR 549,224.97	PKR 6,590,699.59
23	PKR 604,147.46	PKR 7,249,769.55
24	PKR 664,562.21	PKR 7,974,746.51

2. Expected Expenses:

Person A and his family are paying the mortgage of their house for the next 15 years. It is a 5 marla house in Lahore which comes up to **PKR 2 crore**. With a 22% Kibor, we have calculated their monthly mortgage payments to be around 20,000 PKR. Their expenses for the first year based on an average estimate of their financial position comes up to **PKR 140,000** a month and **PKR 1,680,000**. As the question mentioned Person A's debt, we have assumed that he took

informal debt from a close relative for his educational needs and is paying it off slowly. The family's expenses are assumed to be increasing by 9% a year. Since Person A's salary is increasing by 10%, we assume that the family would be improving their lifestyle accordingly. However, the increase must be less than the salary increment to increase their savings component as well since now there is a child in the equation.

Expenses	
Utility	**PKR value**
mortgage	PKR 20,000.00
Electricity	PKR 20,000.00
Gas	PKR 2,000.00
Labor	PKR 12,000.00
Leisure	PKR 27,000.00
debt	PKR 10,000.00
food	PKR 26,000.00
medical coverage	PKR 8,000.00
Travel+Fuel	PKR 15,000.00
Sum	PKR 140.000.00

3. Estimated level of Savings of Now

Right after graduation, Person A saves roughly 5% of his annual income for the first five years. As the person grows older and has to realize his future responsibilities the saving component doubles till his marriage making it a total savings of **PKR 2,190,880**. The assumption is that he keeps his savings in a savings account providing a yearly interest rate of 22%, without Person A withdrawing any amount. In addition, the marriage expenses were covered by the couple's families thus keeping the savings intact.

year after grad	salary	yearly	yearly saving before marriage	saving percentage	present value of saving at y10	
1	PKR 74,217.08	PKR 890,605.00	PKR 44,530.25		PKR 266,620.54	
2	PKR 81,638.79	PKR 979,665.50	PKR 48,983.27		PKR 240,395.57	
3	PKR 89,802.67	PKR 1,077,632.05	PKR 53,881.60	saves 5%	PKR 216,750.11	
4	PKR 98,782.94	PKR 1,185,395.25	PKR 59,269.76		PKR 195,430.42	
5	PKR 108,661.23	PKR 1,303,934.78	PKR 65,196.74		PKR 176,207.76	
6	PKR 119,527.35	PKR 1,434,328.26	PKR 143,432.83		PKR 317,751.70	
7	PKR 131,480.09	PKR 1,577,761.08	PKR 157,776.11	saves 10%	PKR 286,497.43	
8	PKR 144,628.10	PKR 1,735,537.19	PKR 173,553.72		PKR 258,317.36	total value of savings
9	PKR 159,090.91	PKR 1,909,090.91	PKR 190,909.09		PKR 232,909.09	PKR 2,190,879.97

Future Savings

4. Major Life Events

Since Person A just wishes to cover his family for the next 10-15 years, we only see 2 major life events occurring during this time. The child's birth (including pregnancy period) and the child's education from ages 3 to 12.

5. Money required for major life events:

For the pregnancy period, we have calculated the amount using average appointment fees of private clinics which includes the cost of checkups and tests. For childbirth, an average of both a normal birth rate and a C-section has been taken. We assume the child to be healthy at birth. For the next 2 years, the cost of the child's checkups/vaccines and infant-related needs has been included. Thereafter, the child starts his schooling. An average school fee for mid-level private school has been assumed which increases by 5% every year. We are assuming year 1 to be the pregnancy period while year 2 is when the child will be conceived.

year	childbirth	education
1	PKR 60,000.00	PKR 0.00
2	PKR 130,000.00	PKR 0.00
3	PKR 150,000.00	PKR 0.00
4	PKR 75,000.00	PKR 0.00
5	PKR -	PKR 180,000.00
6	PKR -	PKR 189,000.00
7	PKR -	PKR 198,450.00
8	PKR -	PKR 208,372.50
9	PKR -	PKR 218,791.13
10	PKR -	PKR 229,730.68
11	PKR -	PKR 241,217.22
12	PKR -	PKR 253,278.08
13	PKR -	PKR 265,941.98
14	PKR -	PKR 279,239.08
15	PKR -	PKR 293,201.03

6. Amount set aside from an annual savings budget on life events:

The following table displays the amount required annually:

year	childbirth	education	total life events
1	PKR 60,000.00	PKR 0.00	PKR 60,000.00
2	PKR 130,000.00	PKR 0.00	PKR 130,000.00
3	PKR 150,000.00	PKR 0.00	PKR 150,000.00
4	PKR 75,000.00	PKR 0.00	PKR 75,000.00
5	PKR -	PKR 180,000.00	PKR 180,000.00
6	PKR -	PKR 189,000.00	PKR 189,000.00
7	PKR -	PKR 198,450.00	PKR 198,450.00
8	PKR -	PKR 208,372.50	PKR 208,372.50
9	PKR -	PKR 218,791.13	PKR 218,791.13
10	PKR -	PKR 229,730.68	PKR 229,730.68
11	PKR -	PKR 241,217.22	PKR 241,217.22
12	PKR -	PKR 253,278.08	PKR 253,278.08
13	PKR -	PKR 265,941.98	PKR 265,941.98
14	PKR -	PKR 279,239.08	PKR 279,239.08
15	PKR -	PKR 293,201.03	PKR 293,201.03
		Sum of total life event	PKR 2,972,221.69

7. Disposable income:

The disposable income has been calculated by (salary) less (expenses) less (amount required for major life events). For the first year our disposable income came up to **PKR 360,000**.

year	disposable income
1	PKR 360,000.00
2	PKR 348,800.00
3	PKR 394,992.00
4	PKR 544,451.28
5	PKR 523,152.90
6	PKR 608,182.76
7	PKR 704,299.91
8	PKR 812,827.69
9	PKR 935,240.14
10	PKR 1,073,178.76
11	PKR 1,228,470.98
12	PKR 1,403,150.65
13	PKR 1,599,480.78
14	PKR 1,819,978.72
15	PKR 2,067,444.07

8. Annual Premium:

We have assumed that Person A will be paying a level premium throughout the 15 years. The premium is the disposable income available in the first year (this year). For the second year, we will fall short PKR 11,200 due to the birth of the child. However, this won't be an issue due to our previously accumulated savings. Therefore, the Annual Premium would be **PKR 360,000.**

Protection

9. Income required by dependents after Person A's death on an annual basis:

After person 's death, the dependent's expenses decrease as shown in the following table

Expenses after Death		
Utility	PKR value	
mortgage	PKR	20,000.00
Electricity	PKR	20,000.00
Gas	PKR	2,000.00
Labor	PKR	12,000.00
Leisure	PKR	23,333.33
debt	PKR	10,000.00
food	PKR	26,000.00
medical coverage	PKR	8,000.00
Travel+Fuel	PKR	7,500.00
Sum	PKR	128,833.33

The Total Income Required will be the expenses after death + the amount needed for major life events.

year	Income required on annual basis
1	PKR 1,606,000.00
2	PKR 1,676,000.00
3	PKR 1,696,000.00
4	PKR 1,621,000.00
5	PKR 1,726,000.00
6	PKR 1,735,000.00
7	PKR 1,744,450.00
8	PKR 1,754,372.50
9	PKR 1,764,791.13
10	PKR 1,775,730.68
11	PKR 1,787,217.22
12	PKR 1,799,278.08
13	PKR 1,811,941.98
14	PKR 1,825,239.08
15	PKR 1,839,201.03
	PKR 26,162,221.69

10. Insurance Coverage Period:

As person A wants his family to be supported for 10-15 years, we have taken the maximum coverage he requires and set our duration to **15 years**, with the first year being the current year.

11. Single payout:

Based on the above questions, the single payout required is the total income required by dependents for the first year multiplied by 15 years. We subtract our accumulated savings from this value keeping in mind that we will set aside PKR 11,200 from those savings to cover the annual premium in year 2.

	Income required on annual basis
1	PKR 1,606,000.00
2	PKR 1,676,000.00
3	PKR 1,696,000.00
4	PKR 1,621,000.00
5	PKR 1,726,000.00
6	PKR 1,735,000.00
7	PKR 1,744,450.00
8	PKR 1,754,372.50
9	PKR 1,764,791.13
10	PKR 1,775,730.68
11	PKR 1,787,217.22
12	PKR 1,799,278.08
13	PKR 1,811,941.98
14	PKR 1,825,239.08
15	PKR 1,839,201.03
	PKR 26,162,221.69
single payout (income required on annual basis of first year*15)	PKR 24,090,000.00
single payout - (savings-PKR 11,200	PKR 21,910,320.03

12. Will the amount required increase or decrease over time?

The amount will increase over time to offset the increased expenses as the child grows up. In addition, it will also increase to keep the value constant overtime due to the increase in inflation.

13. Nature of Sum Assured

a. Initial Sum Assured:

The amount is calculated by taking out the present value of the total income required after death of Person A each year and also included coverage of his funeral costs.

year	Income required on annual basis		Initial Sum Assured
1	PKR 1,606,000.00		PKR 1,316,393.44
2	PKR 1,676,000.00		PKR 1,126,041.39
3	PKR 1,696,000.00		PKR 933,998.88
4	PKR 1,621,000.00		PKR 731,717.92
5	PKR 1,726,000.00		PKR 638,618.71
6	PKR 1,735,000.00		PKR 526,187.46
7	PKR 1,744,450.00		PKR 433,650.36
8	PKR 1,754,372.50		PKR 357,472.93
9	PKR 1,764,791.13		PKR 294,750.69
10	PKR 1,775,730.68		PKR 243,096.55
11	PKR 1,787,217.22		PKR 200,548.40
12	PKR 1,799,278.08		PKR 165,493.26
13	PKR 1,811,941.98		PKR 136,604.97
14	PKR 1,825,239.08		PKR 112,793.00
15	PKR 1,839,201.03		PKR 93,160.49
total income required	PKR 26,162,221.69	funeral cost	PKR 85,000.00
		total sum assured	PKR 7,395,528.45
		cover multiple	21

b. Cover Multiple:

Person A's Sum Assured/ Annual Premium

7,395,528.45/ 360,000 = 20.5

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c. Payment in case of death:

 Sum Assured + Cash Value

Since the amount required would increase over time due to the increase in the child's needs and wants as well as to account for inflation, Person A would choose this option. Although person A is going for a policy for 15 years only, it's possible that he would need to start saving up for his child's college soon, some of which can be covered if we get a greater sum assured.

iv.   Product features

14. What level of flexibility will the policyholder require with regards to withdrawing funds (categorize qualitatively such as low, medium or high)?

Since all the expenses and the total life event are deducted, and assuming that both the Person A and his wife are healthy individuals in a financially stable position in their lives, there won't be a lot of flexibility required. However, if something unexpected happens which they have not

prepared for, then there might be a little need to withdraw funds thus the level of flexibility the policyholder will require is medium.

15. Are there any optional extras based on the product features that would be attractive to the policyholder in question?

I. **Health cover**: The extra benefit of getting the medical expenses covered by premier health cover reduces our current expenses which significantly increases our yearly savings.

Ii. **Wealth boosters** : Wealth boosters increase the account balance by a specific percentage if the amount is not withdrawn for a specific time. This overall increases our closing account balance and eventually the fund value we receive at the end.In addition, they also help combat inflation.

Iii.**Partial withdrawals**: Given that the person A's flexibility to withdraw funds was medium, this is a very attractive option since it can help in any unplanned event that takes place that requires immediate need of funds.

PART 2- Illustrations found in the attached excel files.

PART 3

1. **Most Value**
   The policy that is of most value to Person A is the **ICICI Pru Signature.** Since the Account Value after 15 years will amount to 10,412,215 PKR and is the highest amount among all policies.

2. **Attractive policy Features**
   The ICICI policy features a lot of attractive products that are suited for Person A's needs. One of them is the **wealth boosters** which help not only increase the fund value and in result the death benefit the family receives but also combats inflation.
   Furthermore, it also allocated **100% of the premium in the investment fund** which significantly increases the closing account balance when the policy matures.
   This along with **partial withdrawals** help cover the policyholder for any unforeseen circumstance where he requires funds. The policy also offers investment flexibility where the policy holder has the ability to choose the fund that suits his risk appetite.
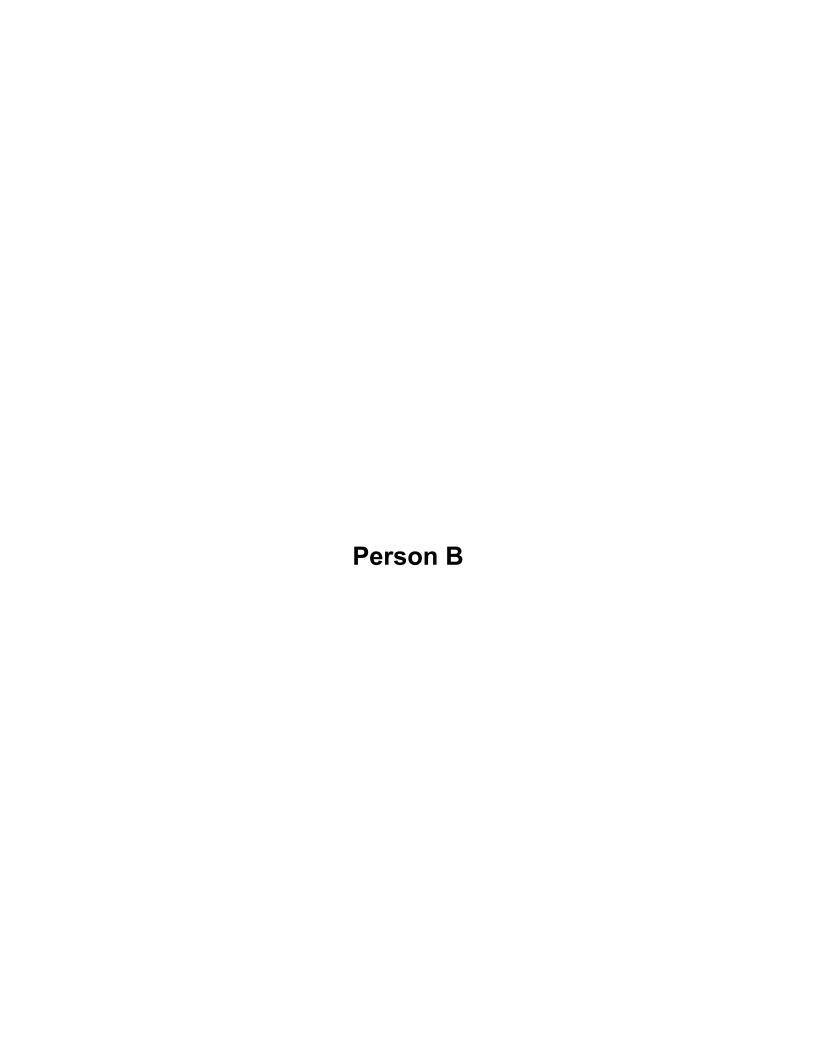
3. **Optional Product Features**
   If Person A survives for a longer period, he gathers more disposable income each year. He can use the **top-up premium** feature in ICICI to increase his fund value as he can top-up a maximum of 99 times.
   If he survives to the end of the policy term, he can choose to **elongate his policy term** even further. Moreover, since he will be earning a salary by the end of 15 years, he can

use the **'settlement option'** where he can get his sum assured on a monthly, yearly or quarterly basis which will give him some extra income along with his salary.

4. **Risk that won't be covered**

   None of the policies cover the risk of **Job/Income** Loss. It's possible that for a period, Person A might not be able to cover the premium if he gets laid off from his job or his company goes under. There are also no covers for any **legal proceedings** that Person A or his family gets into which might require a huge sum of money. Lahore is also subject to **natural disasters** such as earthquakes and heavy-rain floods which is also not covered by any of the policies.

Person B

Description: Person B is recently widowed with 1 dependent at the moment, namely her daughter. She is 40 years old and working a full time job to finance her daughter's highschool expenses(who is currently 17) and their living expenses. She can save around 65,000/month for her daughter's wedding and College expenses. When her husband died, they were saving for past 3 years and were able to accumulate 6 million. She wants a policy for the next 10-15 years to cover her daughter's expenses in case something adverse happens to her.

Current Financial Position

1. **Expected Earnings:**

For now, Person B earns a salary of **PKR 320,000** monthly with yearly increments of 10%(assuming) which is **PKR 3,840,000** per year. She has no intention of quitting and is quite stable at her job.

2. **Expected Expenses:**

Person B owns a house and a car, so there are no mortgages or loans. Their monthly living expenditure sums to **PKR 210,000.** Additionally, she has to pay **PKR 45,000** for her daughter's high school fees which will last for the first two years assuming she is just starting her A Levels Education at age 17. Thus, the yearly expense for the first year is **PKR 3,060,000**. Inflation rate of 9% is taken into account for these expenses.

Since Person B's salary is increasing by 10%, we assume that the family would be improving their lifestyle accordingly.

The Expenses in future will differ in different cases. There are 4 other situations possible for future yearly expenses that are completely mapped out in our excel sheet.

3. Estimated level of Savings of Now

Person B saves **PKR 65,000 per month** from her salary, which makes yearly savings of **PKR 780,000** in the first year. These savings increase annually, considering that salary increment is greater than inflation. Savings are not invested anywhere. And there accumulated level of savings is assumed that her husband and her equally started saving when their daughter turned 14, and the amount they had saved up till now (just before the death of the husband) is **5,728,530 PKR** which is calculated by extending the assumptions we have taken above back to the past.

Future Savings

4. Major Life Events

Since Person B just wishes to cover her daughter for the next 6-10 years, we only see 2 major life events occurring during this time. Her daughter attends LUMS University as a student and after graduating at 23 she wants to marry her fiance after graduating, preferably immediately after graduating.

5. Money required for major life events:

For the college fees, PKR 1.3 million are required for freshman year when daughter will be 19 years, and considering she is a lahore resident she wouldn't hostel expenses. This will increase at the same inflation rate of 9%. This accumulates to a present value of **PKR 1,926,872** (taking a discount rate of 21.5% as per current interest rate)

The wedding expenses are about **PKR 5.5 million**, which can occur between ages 23 and 27 of her daughter. Hence we have discounted them at Year 6 as it will have the highest Present value and helps us take a conservative approach by considering a higher value.

The Following are the the Charges from Year 0 - Year 7:

Year	Age	College Education	Wedding
0	40	-	-
1	41	-	-
2	42	1,300,000	-
3	43	1,417,000	-
4	44	1,544,530	-
5	45	1,683,538	-
6	46	-	5,500,000
7	47	-	-

6. Amount set aside from an annual savings budget on life events:

The Following are the amounts set aside from the the annual Savings Budget:

Year	Age	yearly savings	Major Events Total
0	40	780,000	-
1	41	888,600	-
2	42	1,652,388	1,300,000
3	43	1,847,567	1,417,000
4	44	2,064,958	1,544,530
5	45	2,307,026	1,683,538
6	46	2,576,502	5,500,000
7	47	4,082,921	-

7. Disposable income:

The disposable income has been calculated by (salary) less (expenses) less (amount required for major life events). The following are the disposable income calculations for the next 7 years.

Year	Age	yearly savings	Major Events Total	Disposable Income
0	40	780,000	-	780,000
1	41	888,600	-	888,600
2	42	1,652,388	1,300,000	352,388
3	43	1,847,567	1,417,000	430,567
4	44	2,064,958	1,544,530	520,428
5	45	2,307,026	1,683,538	623,488
6	46	2,576,502	5,500,000	(2,923,498)
7	47	4,082,921	-	4,082,921

8. Annual Premium:

We have assumed that Person B will be paying a level premium throughout the 10 years of policy. The premium is the disposable income available in the first year (this year). Therefore, the Annual Premium would be **PKR 780,000.**

Protection

9. Income required by dependents after Person B's death on an annual basis:

After person B's death, the dependent's living expenses decrease to **PKR 155,000** as shown in the following table:

5 - If Mother Dies then Daughter Expenses	
Transportation	20,000
Electricity	30,000
Grocery	60,000
Utility	30,000
Education	0
Misc. Expenses	15,000
Total	155000

The Total Income Required will be the living expenses after death + Major life events + high school fees (Initial Two years)

Year	Income Required
-	2,400,000
1	2,400,000
2	3,160,000
3	3,277,000
4	3,404,530
5	3,543,538
6	7,360,000
7	1,860,000
8	1,860,000
9	1,860,000
10	1,860,000

10. Insurance Coverage Period:

As person B wants her daughter to be supported for 6-10 years, we have taken the maximum coverage she requires if there is an uncertain delay in her wedding which shifts the wedding cost one year forward and sets our duration to **10 years**, with the first year being the current year.

11. Single payout:

Based on the above questions, the single payout required is the total income required by dependents for the first year multiplied by 10 years.

As we already have some savings cover available from the accumulated savings, our single payout will be the single payout minus accumulated savings.

Single Payout	24,000,000
Single Payout less Savings	18,271,470

12. Will the amount required increase or decrease over time?

The amount will increase in the starting years due to college fees (starting from year 2) and wedding expenses in year 6. After that it will decrease and remain constant.

13. Nature of Sum Assured

a. Initial Sum Assured:

The amount is calculated by taking out the present value of the total income required after death of Person B each year and adding the funeral cost to that amount.

	Sum Assured & Funeral Cost		
Year	Income Required	Single Payout	Initial Sum Assured
-	2,400,000		2,400,000
1	2,400,000		1,975,309
2	3,160,000		2,140,595
3	3,277,000		1,827,038
4	3,404,530		1,562,255
5	3,543,538		1,338,307
6	7,360,000		2,287,811
7	1,860,000		475,860
8	1,860,000		391,654
9	1,860,000		322,349
10	1,860,000		265,308
Single Payout			24,000,000
Single Payout less Savings			18,271,470
total income required			32,985,068
funeral cost			85,000
Total Sum Assured			15,071,486

b. Cover Multiple:

Person B's Sum Assured/ Annual Premium

15,071,486/ 780,000 = 19.32

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c. Payment in case of death:

 Sum Assured + Cash Value

Sum assured plus cash value would be preferred as the amount required increases till 6th year due to major events. Also, her daughter would benefit from receiving a guaranteed value and any amount above that as well as she requires the most coverage available for her daughter if something adverse happens to her.

Product Features

14. What level of flexibility will the policyholder require with regards to withdrawing funds (categorize qualitatively such as low, medium or high)?

Assuming that both Person B and her daughter are healthy individuals in a financially stable position in their lives, and policyholder has savings from before her husband's death (above the amount needed to pay for her daughter's college) so she can use that in case of emergencies. So we can say that her level of flexibility is low in regards to this.

15. Are there any optional extras based on the product features that would be attractive to the policyholder in question?

I. **Health cover**: Medical coverage would be beneficial as Person B is 40 years old and could be at risk of any health concerns. This will also help to reduce expenses and increase savings. Similarly disability and critical illness riders would also be useful for her.
II. **Payor cover rider (or waiver of premium)**: This will help to cover basic premium of the policy in case of person B's critical illness.
III. **Premium top-up:** Since person B has ample savings, this feature will be useful to invest the savings in a fund of choice to maximize returns.
IV. **Family income benefit**: An additional income will be paid to Person B's daughter in case of her death. This will help her to keep sum assured separate for major events and save for any unexpected expenses, while using additional income for living expenses.

PART 2- Illustrations found in the attached excel files.

PART 3

1. **Most Value**
   The policy that is of most value to Person B is the ICICI Pru Signature. The Account Value after 10 years will amount to **11,459,693 PKR** and is the highest amount among all policies.

2. **Attractive policy Features**
   The ICICI policy features a lot of attractive products that are suited for Person A's needs. One of them is the **100% allocation of premium** in the investment fund which helps not only increase the fund value and in result the death benefit the daughter receives.

   In addition, an increase in policy term is allowed which is very attractive since the term is only for ten years. If the woman survives, she can prolong the term which therefore would also increase the death benefit.

3. **Optional Product Features**
   If Person B survives for a longer period, she gathers more disposable income each year. She can use the **top-up premium** feature in ICICI to increase his fund value as he can top-up a maximum of 99 times.

As she has significant savings left to her by her husband, she can add some of it as top up in the fund which can then be invested which will also increase the death benefit for her daughter.

Furthermore, it also allows **premium redirection** which gives the policyholder the ability to choose the asset allocation of where the funds are to be invested. This is an attractive feature, as the person b grows old, she would want to transition the investment allocation to less risky ones which suit her risk appetite.

4. **Risk that won't be covered**
   One of the risks that isn't covered is Person B's **retirement** since none of the plans is catering specifically to this requirement and she is just planning for the next 10 years. Moreover, **property risks** such as damage to car/house due to fire or natural disasters are not covered. Since both females live alone in Lahore, they are exposed to risk of robbery or other **security threats** which has not been covered either.