Student ID	Name							
Q.No.1:- Show that in cluster sampling, $p = \frac{\sum_{i=1}^{n} \frac{a_i}{M}}{n}$ is an unbiased estimator of population proportion $P$								
the sampling variance of the estimator and also find the estimator for sampling variance.								

Q.No.2:- On a canal distributary, there are 56 outlets in the last 10 km length from where the water is supplied to farmers' fields for irrigation. The exact number of farmers using water from these 56 outlets, was not known because of sale and purchase of agricultural land over time. The objective of survey was to assess whether the farmers at the end of distributary were satisfied with the release of water during paddy season, or some more water was required to be released. A WOR simple random sample of 9 outlets was selected, and the views of all the users of the sample outlets were elicited. The response 1 indicates that the fanner was satisfied with the present supply of water, whereas 0 response indicates that additional water needs to be released. The data collected are given in the table below:

Outlet 1: 1, 0, 0, 1 Outlet 2: 0, 1, 1, 1, 0, 0

Outlet 3: 1, 0, 0, 1, 1, 0

Outlet 4: 1, 0, 1, 0, 1, 1, 1, 1, 0

Outlet 5: 0, 1, 0, 1, 0, 0 Outlet 6: 1, 1, 1, 0

Outlet 7: 1, 0, 0, 1, 1, 1 Outlet 8: 0, 1, 1, 1

Outlet 9: 1, 0, 0, 1, 0, 1, 1, 1

Estimate proportion of fanners who are satisfied with the present supply of water, and also construct the confidence interval for it.

Q.No.3:-
(a) Show that $V(p)_{SRS} > V(p_{st})_{Proportional} > V(p_{st})_{Neyman}$ if we ignore the sampling fraction.

Q.No.4:- How does stratification increase efficiency of the estimator of mean/total and proportion?	

Q.No.5:- An insurance company's records show that out of the total of 100 claims, 30 are major claims (above SAR 2500), 40 are average claims (from SAR 1000 to SAR 2500) and 20 are minor (below SAR 1000). Use a suitable sampling method, estimate the total amount of all the 100 claims, and construct the confidence interval for it. The total cost for survey is SAR 100, the overhead cost is SAR 40 and the cost per unit is SAR 5 for each claim.

M	ajor Clair	ns	Average Claims			Minor Claims		
1770	1720	1970	920	1390	950	1050	940	920
1530	1580	910	1560	1430	1530	1650	850	870
1510	1880	2170	1140	980	1490	1220	580	770
1430	2100	1570	1310	1380	1360	1690	900	790
1860	1630	1910	1370	1760	1050	1120	730	650
1650	1980	1970	1410	1250	920	1470	600	840
2220	1750	2350	940	1630	1260	1440	800	560
2130	1160	1820	1370	1090	1640	1490	790	710
1990	1640	1720	1710	1330	1210	850	620	740
1510	1020	1890	880	1230	1100	1210	800	540

Q.No.6:- A sociologist is interested in determining the average degree of mental alertness in persons of age over 80 years in a development block consisting of 70 villages. Since the number of such individuals was not known for each village, a WOR simple random sample of 9 villages was selected. All the persons, with age over 80 years in each selected village, were interviewed and then alertness was ranked from 0 to 10. The score of 10 was given to the persons with perfect mental alertness, whereas 0 score was meant for persons who were not in control of their mental faculties. The scores for their mental alertness, are given below for the 9 villages.

Village		Mental alertness in persons of age over 80 years									
1	4	6	1	3	7	9	2				
2	3	5	2	9	6	8	4	10	5	3	6
3	5	7	9	4							
4	6	9	8	2	5						
5	1	5	9	8	4	3	8	10			
6	6	8	4	2	5	7					
7	5	7	9	1							
8	2	4	9	7	10	1	10				
9	3	6	2	4	9	10	1	9	5		

Estimate the average mental alertness for the population of persons aged above 80 years in the development						
block, and place confidence limits on this average.						