

Indian Statistical Institute, Bangalore Centre

MS(QMS) First semester – Statistics for Decision Making 1

Time: 3 hrs

End-semester exam (Maximum marks: 100)

November 24, 2018

[Provide necessary details in your answers. You may use statistical softwares for the required computations.]

1. The height of a particular group of students was having a Mean of 5 ft. 4.3 inches and a S.D. of 2.6 inches. The same group of students were sent to a Health Centre for check-up. The scale for checking height in the health centre was in centimetres. Further, Lab Assistant who was measuring height was unaware of the fact that the scale had a positive bias of +3.9 cm. (i.e., a person with a height of x cm would be read as $(x + 3.9)$ cm). What will be the mean and standard deviation of the height readings obtained in the Health Centre? [15]
2. State and briefly explain different methods of sampling. Highlight where particular ones can be implemented. [15]
3. The distribution of annual earnings of bank tellers with five years experience is skewed negatively, with a mean of Rs. 23000 and standard deviation of Rs. 1500. If we take a random sample of 40, what is the probability that their average earning will be less than 24500 ? [15]
4. Suppose that 10 sample locations are surveyed by an observer who is recoding the deer sightings in a forest. The following two variables are considered to be studied: distance (in meters) from observer (x), number of deers sighted (y).

x	26	37	24	45	26	50	28	30	40	34
y	36	27	39	19	35	17	30	28	20	23

- (a) Plot scatter diagram to explore the relationship and give your comments.
 - (b) Find the correlation coefficient.
 - (c) Find out the regression line.
 - (d) Using the regression Line, predict the number of observed deers when the distance is 60 meters. [15]
5. The following dataset in Table 1 (viz. `mtcars`) was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption (`mpg`) and 5 other aspects of automobile design (`disp`, `hp`, `drat`, `wt`, `qsec`) and performance for 32 automobiles (1973-74 models). Here `mpg` = Miles/(US) gallon, `disp` = Displacement (cu.in.), `hp` = Gross horsepower, `drat` = Rear axle ratio, `wt` = Weight (1000 lbs), `qsec` = 1/4 mile time.
 - (a) Obtain the multiple regression line of `mpg` on the five predictor variables `disp`, `hp`, `drat`, `wt`, `qsec`.
 - (b) Obtain the ANOVA table and estimate of error variance.
 - (c) Find the R^2 and adjusted- R^2 .
 - (d) Check model linearity, normality of errors, homoscedasticity and presence of outliers.
 - (e) Describe your findings. [25]
 6. (a) Using Random Number Table in RMMR Tables, Generate 30 Random numbers (4-digitated).
 - (b) Use these random numbers to generate 30 Random Samples from a Normal distribution with a mean of 100 and a standard deviation of 3.5. [25]



Table 1

	mpg	disp	hp	drat	wt	qsec
Mazda RX4	21	160	110	3.900	2.620	16.460
Mazda RX4 Wag	21	160	110	3.900	2.875	17.020
Datsun 710	22.800	108	93	3.850	2.320	18.610
Hornet 4 Drive	21.400	258	110	3.080	3.215	19.440
Hornet Sportabout	18.700	360	175	3.150	3.440	17.020
Valiant	18.100	225	105	2.760	3.460	20.220
Duster 360	14.300	360	245	3.210	3.570	15.840
Merc 240D	24.400	146.700	62	3.690	3.190	20
Merc 230	22.800	140.800	95	3.920	3.150	22.900
Merc 280	19.200	167.600	123	3.920	3.440	18.300
Merc 280C	17.800	167.600	123	3.920	3.440	18.900
Merc 450SE	16.400	275.800	180	3.070	4.070	17.400
Merc 450SL	17.300	275.800	180	3.070	3.730	17.600
Merc 450SLC	15.200	275.800	180	3.070	3.780	18
Cadillac Fleetwood	10.400	472	205	2.930	5.250	17.980
Lincoln Continental	10.400	460	215	3	5.424	17.820
Chrysler Imperial	14.700	440	230	3.230	5.345	17.420
Fiat 128	32.400	78.700	66	4.080	2.200	19.470
Honda Civic	30.400	75.700	52	4.930	1.615	18.520
Toyota Corolla	33.900	71.100	65	4.220	1.835	19.900
Toyota Corona	21.500	120.100	97	3.700	2.465	20.010
Dodge Challenger	15.500	318	150	2.760	3.520	16.870
AMC Javelin	15.200	304	150	3.150	3.435	17.300
Camaro Z28	13.300	350	245	3.730	3.840	15.410
Pontiac Firebird	19.200	400	175	3.080	3.845	17.050
Fiat X1-9	27.300	79	66	4.080	1.935	18.900
Porsche 914-2	26	120.300	91	4.430	2.140	16.700
Lotus Europa	30.400	95.100	113	3.770	1.513	16.900
Ford Pantera L	15.800	351	264	4.220	3.170	14.500
Ferrari Dino	19.700	145	175	3.620	2.770	15.500
Maserati Bora	15	301	335	3.540	3.570	14.600
Volvo 142E	21.400	121	109	4.110	2.780	18.600