1. Benderson Accounting hires approximately 20 new employees each year. Their critics suggest that Benderson is discriminating against women by paying their female recruits differently than their male recruits. The following are the salaries of employees that Benderson hired in 1992. They are separated by gender, with their positions listed.

Position	Male	Female
Secretary I	15,000	15,500
Secretary II	16,300	16,500
Senior Account Clerk	18,500	18,500
Accounting Assistant I	22,000	22,500
Accounting Assistant II	26,000	26,500
Accounting Assistant III	29,000	30,000
Account Executive	32,000	33,000
Senior Account Executive	38,000	39,000
Project Manager	47,000	40,000

a) The results above suggest that women hired at Benderson were actually paid more in 1992. Find the exact probability that this many women (or more) would have a higher salary than their male counterparts. (10%)

b) Using the data above, test the critics' hypothesis that females are paid differently than males. (α =0.05) (10%)

2. In an experiment to determine the efficacy of tropical feedstuffs for raising chickens, a random sample of 20 baby chicks was chosen from a large hatchery. Four feedstuffs were tested, with 5 chicks assigned to each type of feed. The weight gains were:

Type 1	Type 2	Type 3	Type 4
55	61	42	169
49	112	97	137
42	30	81	169
21	89	95	85
52	63	92	154
Means 43.8	71	81.4	142.8

SSTO=S_{YY}=37793.75

SSTR=26234.95

a) Please construct an ANOVA table. Is there any evidence that the feeds produce different mean weight gains? (α =0.05) (15%)

b) Feedstuffs 2 and 3 are very inexpensive. Is there any evidence that types 2 and 3 differ from one another? (10%)

c) When using ANOVA, the regression assumptions should be checked by examining the usual residual plots. However, there is no need to look for high leveraged points. Why? (5%)

3. A company with a fleet of cars contracts for body repair work. To see if there is a tendency for the bid from one body shop to be higher or lower than a bid on the same job from another body shop, 10 cars needing repairs were sent to both body shops for bids, with the following results:

	1	2	3	4	5	6	7	8	9	10
Shop A	**261**	**292**	**317**	**253**	**271**	**305**	**238**	**320**	**267**	**281**
Shop B	**251**	**247**	**308**	**258**	**267**	**256**	**230**	**268**	**269**	**275**

Assume these 10 cars resemble a random sample of cars. Use the Wilcoxon signed-ranks test for equality of mean bids at $\alpha = 0.05$. (20%)

4. Suppose that we know the value of symmetric positive definite matrix $\boldsymbol{\Sigma}$, such that the covariance matrix for the error vector $\mathbf{e}$ is given by $\text{var}(\mathbf{e}) = \sigma^2\boldsymbol{\Sigma}$, with $\sigma^2 > 0$, but not necessarily known.
   a) Will the ordinary least squares estimator of $\boldsymbol{\beta}$ be unbiased?(5%)
   b) Will it be the minimum variance estimator?(5%)
   c) Consider the model
   $$\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{e}$$
   $\text{var}(\mathbf{e}) = \sigma^2\boldsymbol{\Sigma}$, $\boldsymbol{\Sigma}$ known
   Write down the matrix forms for generalized residual sum of squares RSS and the generalized least squares estimator $\hat{\boldsymbol{\beta}}$.(10%)
   (note: all **boldface letter** represents a matrix or a vector)

5. What are the underlying assumptions in applying regression model. (5%)

6. What are the basic components of a time series (5%)

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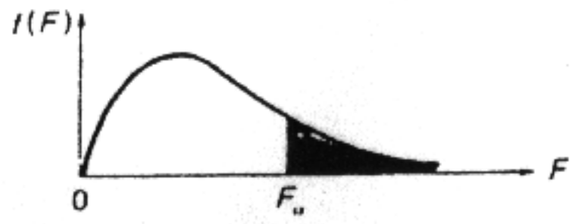
(b) $\alpha = .05$



DENOMINATOR DEGREES OF FREEDOM (ν_2) \ NUMERATOR DEGREES OF FREEDOM (ν_1)	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

PERCENTAGE POINTS OF T DISTRIBUTIONS

ν \ Upper tail area	0.25	0.10	0.05	0.025	0.01	0.005
1	1.000	3.078	6.314	12.706	31.821	63.657
2	0.816	1.886	2.920	4.303	6.965	9.925
3	0.765	1.638	2.353	3.182	4.541	5.841
4	0.741	1.533	2.132	2.776	3.747	4.604
5	0.727	1.476	2.015	2.571	3.365	4.032
6	0.718	1.440	1.943	2.447	3.143	3.707
7	0.711	1.415	1.895	2.365	2.998	3.499
8	0.706	1.397	1.860	2.306	2.896	3.355
9	0.703	1.383	1.833	2.262	2.821	3.250
10	0.700	1.372	1.812	2.228	2.764	3.169
11	0.697	1.363	1.796	2.201	2.718	3.106
12	0.695	1.356	1.782	2.179	2.681	3.055
13	0.694	1.350	1.771	2.160	2.650	3.012
14	0.692	1.345	1.761	2.145	2.624	2.977
15	0.691	1.341	1.753	2.131	2.602	2.947
16	0.690	1.337	1.746	2.120	2.583	2.921
17	0.689	1.333	1.740	2.110	2.567	2.898
18	0.688	1.330	1.734	2.101	2.552	2.878
19	0.688	1.328	1.729	2.093	2.539	2.861
20	0.687	1.325	1.725	2.086	2.528	2.845
21	0.686	1.323	1.721	2.080	2.518	2.831
22	0.686	1.321	1.717	2.074	2.508	2.819
23	0.685	1.319	1.714	2.069	2.500	2.807
24	0.685	1.318	1.711	2.064	2.492	2.797
25	0.684	1.316	1.708	2.060	2.485	2.787
26	0.684	1.315	1.706	2.056	2.479	2.779
27	0.684	1.314	1.703	2.052	2.473	2.771
28	0.683	1.313	1.701	2.048	2.467	2.763
29	0.683	1.311	1.699	2.045	2.462	2.756
30	0.683	1.310	1.697	2.042	2.457	2.750
40	0.681	1.303	1.684	2.021	2.423	2.704
60	0.679	1.296	1.671	2.000	2.390	2.660
120	0.677	1.289	1.658	1.980	2.358	2.617
∞	0.674	1.282	1.645	1.960	2.326	2.576

試題請隨卷繳回