

八十八學年度 工科系 系(所) ^{乙、丙、丁} 戊、己 組碩士班研究生招生考試

科目 工程數學 科號 ^{3301, 3401, 3501} 3601, 3901 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

1. (5%) Prove that either the row vectors or the column vectors of a non-square matrix are linearly dependent.
2. (10%) Evaluate $\iint_S \mathbf{F} \cdot \mathbf{n} \, dA$, where $\mathbf{F} = z\mathbf{i} - z^2\mathbf{k}$, $S: x^2 + 4y^2 + z^2 = 4, x \geq 0, y \geq 0, z \geq 0$
3. (20%) Find the deflection $u(x,y,t)$ of the square membrane corresponding to $0 \leq x \leq 1, 0 \leq y \leq 1$ with $c = 1$, initial deflection $f(x,y) = kx(1-x^2)y(1-y^2)$, and initial velocity zero.
4. Find the coefficients a_{-1} , a_0 , and a_1 , of the Laurent series $\sum_{n=-\infty}^{\infty} a_n z^n$ of $\sec z$ in $\pi/2 < |z| < 3\pi/2$.
(20%)
5. If the breaking strength of certain ropes is normal (see Table A) with mean 100 kg and standard deviation 10 kg, what is the maximum load such that we can expect at most 1% of the ropes to break?
(10%)
6. Given first-order differential equations

$$y_1'(t) = -\lambda_1 y_1(t)$$

$$y_2'(t) = \lambda_1 y_1(t) - \lambda_2 y_2(t)$$
 with $y_1(0) = y_{10}$ and $y_2(0) = 0$, solve for $y_1(t)$ and $y_2(t)$.
(10%)
7. Find the general solution of the following second-order differential equation

$$y''(x) - 4y(x) = 5(\cosh 2x - x).$$
 (10%)
8. Solve $x'(t) - x(t) = f(t)$, where $x(0) = 0$ and

$$f(t) = \begin{cases} t & \text{on } 0 \leq t \leq 3, \\ 3 & \text{on } t > 3. \end{cases}$$
 (15%)

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科目 工程數學 科號 3601, 3701 共 2 頁第 2 頁 *請在試卷【答案卷】內作答

Table A
Normal Distribution

Values of the distribution function $\Phi(z)$
 $\Phi(-z) = 1 - \Phi(z)$, $\Phi(0) = 0.5000$

0.01	5040	0.51	6960	1.01	8438	1.51	9345	2.01	9778	2.51	9940
0.02	5080	0.52	6985	1.02	8461	1.52	9357	2.02	9783	2.52	9941
0.03	5120	0.53	7019	1.03	8485	1.53	9370	2.03	9788	2.53	9943
0.04	5160	0.54	7054	1.04	8508	1.54	9382	2.04	9793	2.54	9945
0.05	5199	0.55	7088	1.05	8531	1.55	9394	2.05	9798	2.55	9946
0.06	5239	0.56	7123	1.06	8554	1.56	9406	2.06	9803	2.56	9948
0.07	5279	0.57	7157	1.07	8577	1.57	9418	2.07	9808	2.57	9949
0.08	5319	0.58	7190	1.08	8599	1.58	9429	2.08	9812	2.58	9951
0.09	5359	0.59	7224	1.09	8621	1.59	9441	2.09	9817	2.59	9952
0.10	5398	0.60	7257	1.10	8643	1.60	9452	2.10	9821	2.60	9953
0.11	5438	0.61	7291	1.11	8665	1.61	9463	2.11	9826	2.61	9955
0.12	5478	0.62	7324	1.12	8686	1.62	9474	2.12	9830	2.62	9956
0.13	5517	0.63	7357	1.13	8708	1.63	9484	2.13	9834	2.63	9957
0.14	5557	0.64	7389	1.14	8729	1.64	9495	2.14	9838	2.64	9959
0.15	5596	0.65	7422	1.15	8749	1.65	9505	2.15	9842	2.65	9960
0.16	5636	0.66	7454	1.16	8770	1.66	9515	2.16	9846	2.66	9961
0.17	5675	0.67	7486	1.17	8790	1.67	9525	2.17	9850	2.67	9962
0.18	5714	0.68	7517	1.18	8810	1.68	9535	2.18	9854	2.68	9963
0.19	5753	0.69	7549	1.19	8830	1.69	9545	2.19	9857	2.69	9964
0.20	5793	0.70	7580	1.20	8849	1.70	9554	2.20	9861	2.70	9965
0.21	5832	0.71	7611	1.21	8869	1.71	9564	2.21	9864	2.71	9966
0.22	5871	0.72	7642	1.22	8888	1.72	9573	2.22	9868	2.72	9967
0.23	5910	0.73	7673	1.23	8907	1.73	9582	2.23	9871	2.73	9968
0.24	5948	0.74	7704	1.24	8925	1.74	9591	2.24	9875	2.74	9969
0.25	5987	0.75	7734	1.25	8944	1.75	9599	2.25	9878	2.75	9970
0.26	6026	0.76	7764	1.26	8962	1.76	9608	2.26	9881	2.76	9971
0.27	6064	0.77	7794	1.27	8980	1.77	9616	2.27	9884	2.77	9972
0.28	6103	0.78	7823	1.28	8997	1.78	9625	2.28	9887	2.78	9973
0.29	6141	0.79	7852	1.29	9015	1.79	9633	2.29	9890	2.79	9974
0.30	6179	0.80	7881	1.30	9032	1.80	9641	2.30	9893	2.80	9974
0.31	6217	0.81	7910	1.31	9049	1.81	9649	2.31	9896	2.81	9975
0.32	6255	0.82	7939	1.32	9066	1.82	9656	2.32	9898	2.82	9976
0.33	6293	0.83	7967	1.33	9082	1.83	9664	2.33	9901	2.83	9977
0.34	6331	0.84	7995	1.34	9099	1.84	9671	2.34	9904	2.84	9977
0.35	6368	0.85	8023	1.35	9115	1.85	9678	2.35	9906	2.85	9978
0.36	6406	0.86	8051	1.36	9131	1.86	9686	2.36	9909	2.86	9979
0.37	6443	0.87	8078	1.37	9147	1.87	9693	2.37	9911	2.87	9979
0.38	6480	0.88	8106	1.38	9162	1.88	9699	2.38	9913	2.88	9980
0.39	6517	0.89	8133	1.39	9177	1.89	9706	2.39	9916	2.89	9981
0.40	6554	0.90	8159	1.40	9192	1.90	9713	2.40	9918	2.90	9981
0.41	6591	0.91	8186	1.41	9207	1.91	9719	2.41	9920	2.91	9982
0.42	6628	0.92	8212	1.42	9222	1.92	9726	2.42	9922	2.92	9982
0.43	6664	0.93	8238	1.43	9236	1.93	9732	2.43	9925	2.93	9983
0.44	6700	0.94	8264	1.44	9251	1.94	9738	2.44	9927	2.94	9984
0.45	6736	0.95	8289	1.45	9265	1.95	9744	2.45	9929	2.95	9984
0.46	6772	0.96	8315	1.46	9279	1.96	9750	2.46	9931	2.96	9985
0.47	6808	0.97	8340	1.47	9292	1.97	9756	2.47	9932	2.97	9985
0.48	6844	0.98	8365	1.48	9306	1.98	9761	2.48	9934	2.98	9986
0.49	6879	0.99	8389	1.49	9319	1.99	9767	2.49	9936	2.99	9986
0.50	6915	1.00	8413	1.50	9332	2.00	9772	2.50	9938	3.00	9987