فو كهربية - مجالات كهرومغناطيسية

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Electromagnetic fields	Course Code: EPM 2104 – 2142	Year: 3rd
Date: 4 Jan 2013 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

Answer the following questions:

Question (1) (22 Marks)

(a) Starting from Gauss law and Maxwell first equation, constitute the divergence theorem. (6 Marks)

(b) Using two different methods, derive an expression for the electric field intensity E due to an infinite sheet of uniformly distributed charge with density ρ_s C/m^2. (8 Marks)

(c) A line charge, $\rho_L = 40$ nC/m is located along the line x = 2 and y = 3 in free space.

i) Find E at (1, 2, 5). (3 Marks)

ii) If the surface x = 4 contains a surface charge density ρ_s 20 nC/m^2, which locus in free space that have $E_{total} = 0$. (5 Marks)

Question (2) (23 Marks)

(a) Derive the boundary conditions at the interface between a conductor and a dielectric. (5 Marks)

(b) A uniform volume charge density $\rho_v = 60\rho$ C/m^3, lies within the cylinder $\rho = 1$ m, and $\rho_v = 0$ elsewhere.

i) Find D everywhere. (4 Marks)

ii) What surface charge density ρ_s should be on the cylinder $\rho = 3$ m so that $(D)_{\rho=2}$ is twice $(D)_{\rho=5}$. (4 Marks)

(c) Two concentric conducting spheres of radii a = 4 cm and b = 6 cm have equal and opposite charges, 10^{-8} C on the inner sphere and -10^{-8} C on the outer one. The region between the spheres has $\varepsilon = \varepsilon_0$. The inner sphere was kept at a potential of 500 V.

i) Find the potential difference between the spheres. (Derive any expression used) (3 Marks)

ii) Find the capacitance. (2 Marks)

iii) Find the equipotential surface at which the potential is 100 V. (2 Marks)

iv) Plot the potential V versus r. (3 Marks)

Question (3) (20 Marks)

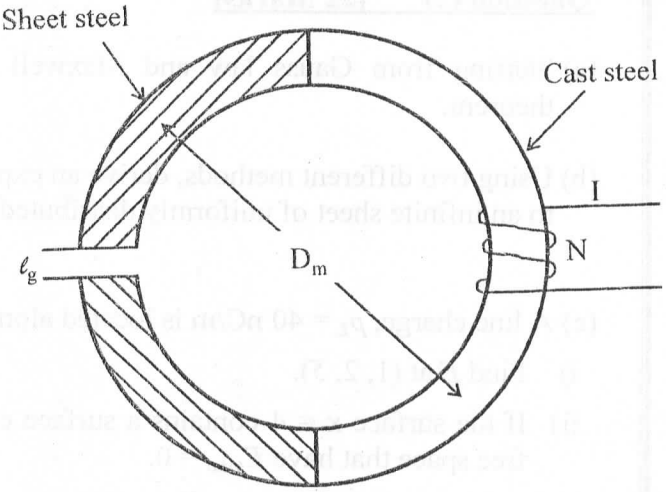
(a) For the magnetic circuit shown in the Figure, assume constant permeabilities of 0.002 and 0.001 for sheet steel and cast steel, respectively. Assume also leakage and fringing coefficients of 1.2 each, $\ell_g = 0.5$ cm, N = 500, iron cross section area = 2 cm^2 and $D_m = 20$ cm. Find:

i) The current I in amperes required to establish a flux in the air-gap of $\Phi = 0.2$ m Wb. (10 Marks)

ii) The magnetic susceptibility and the magnetization due to the magnetic dipoles of the sheet steel. (3 Marks)

iii) The self inductance of the shown coil. (3 Marks)

iv) The mutual inductance between the shown coil and another coil of 100 turns surrounding the air gap only. (3 Marks)



(b) Using a scale of one cm to represent both 0.2 T and 400 A/m, draw the linear part of a magnetization curve that passes through the point (B=1.1 T, H=440 A/m), then calculate the relative permeability of the material. (1 Marks)

Question (4) (20 Marks)

(a) Write down Maxwell's equations in the integral form for time varying fields in free space. (3 Marks)

NOTE: YOUR ANSWER WILL NOT BE GRADED IF ANY SINGLE EQUATION NOT APPLICABLE TO THE QUESTION IS WRITTEN.

(b) Consider a uniform magnetic field B. Deduce an expressions for the electric field E at any point of the circumference of a stationary circular loop of radius r situated in a plane perpendicular to B when:

i) B is a time varying field. (9 Marks)

ii) B is a steady field. (2 Marks)

(c) A dc voltage supply of V volts supplies a resistance of R Ohms in series with a parallel capacitor of capacitance C Farads, relative permittivity ϵ and thickness d meters. Drive expressions for:

i) dD/dt in $C/m^2.s$ as a function of time. (3 Marks)

ii) Polarization at $t = \infty$. (3 Marks)

Good Luck

Assoc. Prof. Ahmed I. Shobair
Dr. Diaa-Eldin A. Mansour

٣ فون كهربية

Tanta University	Department: Electrical Power and Machines Engineering Total Marks: 70 Marks	Faculty of Engineering
Course code: EPM3112 Date: 18 Jan 2014	Course title: High Voltage Engineering Allowed time: 3 hrs	Year: 3rd No. of pages: (2)

Answer all the following questions:

Question (1) (17 Marks)

a) Derive Townsend expression for current growth. What is the condition of breakdown according to this mechanism? (4 Marks)

b) Plot the graphical representation of Paschen's law. Explain the physical mechanisms in the different regions of the graph. (4 Marks)

c) The following data are obtained while studying the breakdown in a gas:

Gap (mm)	0.75	2.0	2.5	3	3.5	4.0	4.5	5.0	5.5	6
$I\times10^{-14}$ (A)	4	12	18.66	29	45	69.9	109	242	570	890

The minimum current observed is 4×10^{-14} A. Calculate the values of the Townsend's primary and secondary ionization coefficients. (4 Marks)

d) Compare between breakdown voltage of a gas gap under high DC voltages and under impulse voltages. (3 Marks)

e) Complete the following sentences: (2 Marks)

1. With increasing the mean free path of a gas, the probability of breakdown (***increases – decreases – doesn't affect***).
2. The gases in which electron attachment plays an active role are called .....

Question (2) (17 Marks)

a) Describe with only sketches the cavity theory of breakdown in liquid dielectrics. (4 Marks)

b) If the applied field to a liquid is given as $E = 2 * 10^6 X^{1.2}$ V/m and the relative permittivity of the liquid is 2.1, calculate the force acting on an impurity with a relative permittivity of 3.0 and a radius of 20 mm travelling at a distance of 1 cm. (4 Marks)

c) A solid dielectric has a relative permittivity of 4, a young's modulus of 10^5 kg/cm^2 and tan δ of 0.001 is subjected to an alternating voltage at a frequency of 50 Hz. If the heat dissipated is 1 W/cm^3 and the applied electric field is 5 MV/cm, which mechanism of breakdown is expected? (4 Marks)

d) Explain electromechanical breakdown in solid dielectrics with driving an expression for the highest field stress before breakdown. (3 Marks)

e) Complete the following sentences: (2 Marks)

1. Breakdown into solid dielectrics usually takes the form of .....
2. In pure liquids, the considered breakdown mechanism is .....

Question (3) **(18 Marks)**

a) The number of stages of a Cockcroft-Walton type voltage multiplier with 80 nf capacitances is 9 stages. If the voltage regulation at a load current of 8 mA is 8%, calculate the maximum secondary voltage of the supply transformer at a frequency of 100 Hz. Find also the percentage ripple and the optimum number of stages for minimum voltage drop. (4 Marks)

b) Draw the schematic diagram of three stage cascaded transformer with center-tapped high voltage winding. Show on the diagram the needed insulation for each stage. (4 Marks)

c) Draw the equivalent circuit of Tesla coil. What is the needed condition for frequency tuning? (4 Marks)

d) An impulse generator with each condenser rated for 0.12 μF and 130 kV. The load capacitor is 1200 pF and the series resistance is 1000 Ω. Find the number of stages and the damping resistance needed to produce a 3.396/60 μs impulse wave. Calculate the maximum output voltage if the charging voltage is 100 kV. (4 Marks)

e) Complete the following sentences: (2 Marks)

1. The voltage efficiency of an impulse generator is given by .....
2. ..... is the process of eliminating the effect of stray capacitance in potential divider by surrounding the resistor with a conducting metal kept at the mean potential of the resistor

Question (4) **(18 Marks)**

a) Compare between the attenuation factor in the following cases: (4 Marks)

1. Resistive potential divider.
2. Resistive potential divider connected to a measuring cable with capacitance C_m.
3. Resistive potential divider connected to a measuring cable and compensated.
4. Capacitive potential divider.

b) A high-voltage, 50 Hz AC signal of amplitude X with a superimposed DC component of Y was measured by a peak voltmeter and an electrostatic voltmeter. The reading of the peak voltmeter was 40 kV and the reading of the electrostatic voltmeter was 30 kV. Find the values of X and Y. (4 Marks)

c) Describe with only sketches the mechanism of lightning stroke. (4 Marks)

d) A single-phase lossless overhead line with $Z_A = 400\ \Omega$, $\upsilon_A = 3 * 10^8$ m/s and $L_A = 30$ km is connected to a single phase lossless cable with $Z_B = 100\ \Omega$, $\upsilon_B = 2 * 10^8$ m/s and $L_B = 20$ km. At the sending end of line A, there is a generator with an impedance of $Z_G = Z_A/4$. At the receiving end of cable B is a short circuit. Calculate the voltage at the line-cable junction at the time 0.4 ms. (6 Marks)

Best wishes:

Dr. Diaa-Eldin Mansour

٢ عقوى

Tanta University | Department: Computers Engineering and Automatic Control | Faculty of Engineering

Total Marks: **85 Marks**

Course Title: **Control Systems Engineering**	Course Code: **CCE3170**	Year: **3rd Power**
Date: **Jan. 20th, 2014**	Allowed time: **3 Hours**	No. of Pages: **3**

Remarks: You must show all of your work -- partial credit may be given to partially correct answers, while answers with no justification may not receive full points. Please attempt all questions.

Problem (1) **(21 Marks)**

a) The electric equivalent circuit of the armature and the free-body diagram of the rotor of a DC motor are shown in Fig.1. The definitions of the physical parameters are:

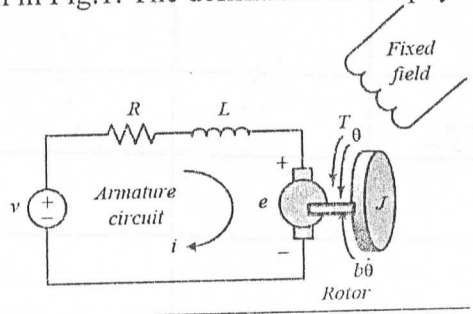


Fig. 1: Schematic diagram of problem 1-a

(J) moment of inertia of the rotor
(b) motor viscous friction constant
(K_b) electromotive force constant
(R) electric resistance
(L) electric inductance
(K_t) motor torque constant

The block diagram representation of this system is as in Fig. 2. **Drive a state-space representation of the system (10 Marks)**

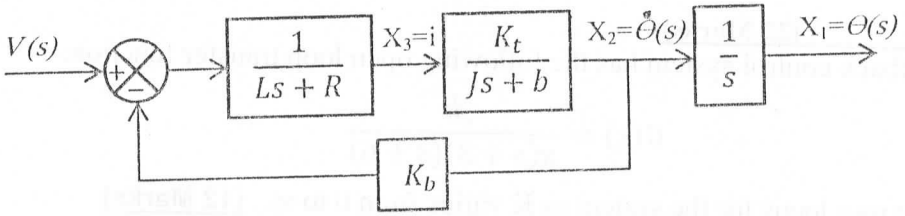


Fig. 2: Schematic diagram of problem 1-a

b) The state-space representation of a satellite system is given by:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 0 & 1 \end{bmatrix} x(t)$$

i- Calculate the state-transition matrix Φ(t) **(3 Marks)**
ii- Find the system transfer function and check the stability **(4 Marks)**
iii- Check the system controllability and observability **(4 Marks)**

Problem (2) **(22 Marks)**

a) For the unity feedback control system shown in Fig. 3,
- Find the range of K for which the system is stable **(9 Marks)**
- What is the value of K for critical stability and what is the frequency of oscillation

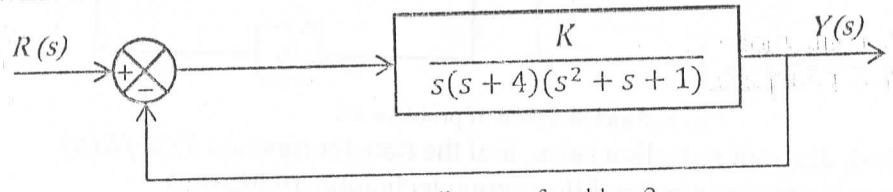


Fig. 3: Block diagram of problem 2-a

P.T.Q.

i- The unit step response shown in Fig. 4 was generated from a second-order system. Determine the transfer function for this system. **(10 Marks)**

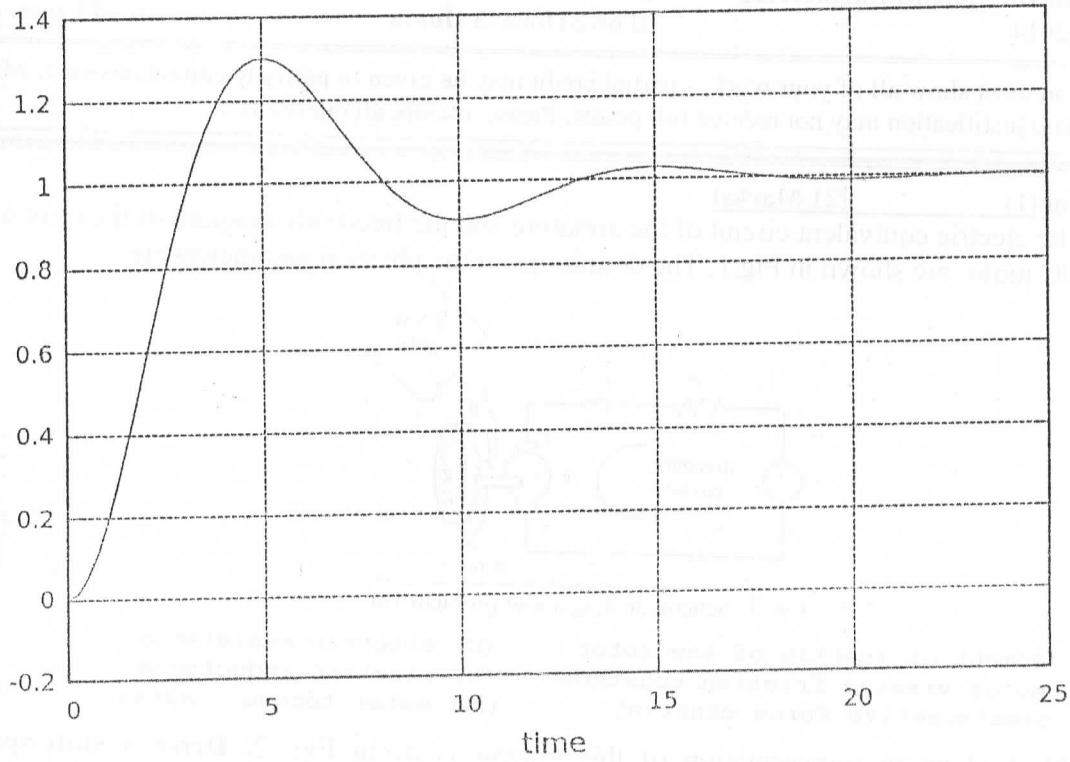


Fig. 4: Block diagram of problem 2-b

Problem (3) **(22 Marks)**

a) A unity feedback control system has the following open loop transfer function:

$$G(s) = \frac{k}{s(s+3)(s+6)}$$

i. Sketch the root locus for the system as K varies from 0 to ∞. **(12 Marks)**
ii. Calculate the gain K value corresponding to a damping ratio 0.5 **(4 Marks)**

b) A unity feedback control system has the following open-loop transfer function: **(6 Marks)**

$$G(s) = \frac{1}{s(0.5s+1)(0.2s+1)}$$

Determine the steady-state errors for unit step, unit ramp, and unit acceleration inputs

Problem (4) **(20 Marks)**

a) For the block diagram given in Fig.5 **(12 Marks)**

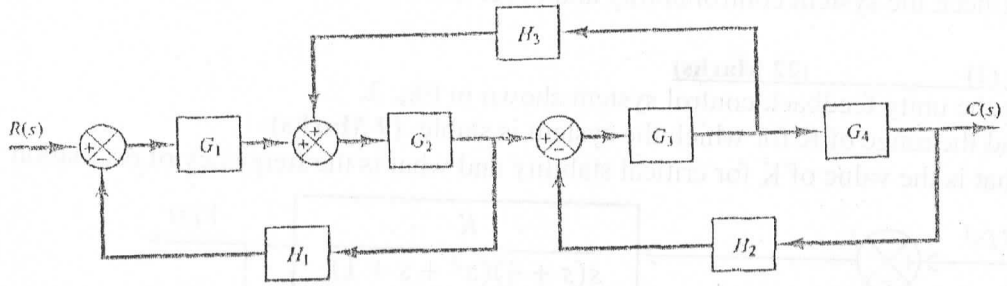


Fig. 5: Block diagram of problem 4-a

i- Using block diagram reduction rules, find the transfer function $Y(s)/R(s)$
ii- Check your answer using signal flow graph technique **(6 Marks)**

b) Consider a unity-feedback system with the following forward transfer function:

$$G(s) = \frac{s^2 - 2s + 2}{(s+1)(s+2)}$$

For each of the labelled points below (A - G) in Fig.6, state whether or not each point lies on the root locus. You must provide a justification for each point. Some points will require calculations to judge, while others can be ruled in or out by one or more of the sketching rules. Give your final answers in the form of a table. **(3 Marks)**

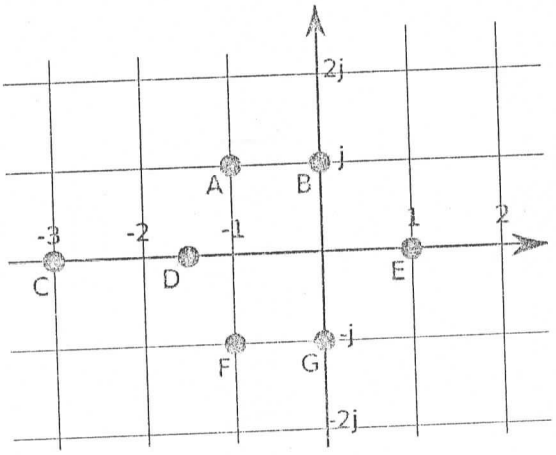


Fig. 6: Block diagram of problem 4-b

c) i- Consider the RC low-pass filter shown in Fig.7, show that $H_1(s)$ is given by:

$$H_1(s) = \frac{1}{1 + sR_1C_1}$$

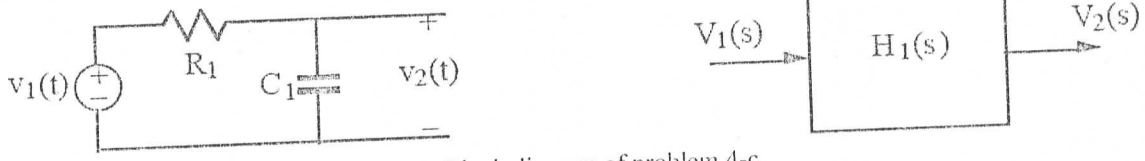


Fig. 7: Block diagram of problem 4-c

ii- If we connect - in cascade - two RC low-pass filters as in Fig.8, determine the expressions for $H_1(s)$ and $H_2(s)$. **(3 Marks)**

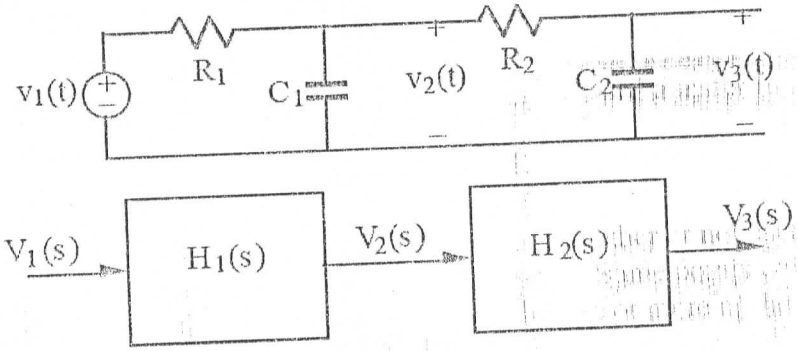


Fig. 8: Block diagram of problem 4-c

Good Luck

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 90 Marks

Faculty of Engineering

Title: Generation and economy of electrical energy	Course Code: EPM3110	Year: Third year
Date: January 11th 2012 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

الإمتحان مكون من ٣ أسئلة فى صفحتين

Problem number (1) (30 Marks)

a) Define the following terms: Spinning reserve, Base load, Capacity factor, Diversity factor and Load energy curve. (10 points)

b) A thermal power plant has a min. and max. power of 35 and 450 MW respectively. The input fuel in (Btu/h) for the plant is given by: $F = (28 + 2.16\,P + 0.015\,P^2)*10^6$, where P is the generated power in (MW). Illustrate the input-output curve, the heat rate curve and the curve of the incremental fuel cost in \$/MWh of the power plant against the output power. Assume a fuel cost of $0.08*10^{-6}$ \$/Btu. (10 points)

c) An equipment in a power station has a capital cost of 4.6×10^6 L.E. and a salvage value of 600000 L.E. at the end of the 20th year. Calculate the depreciation using the three methods at the end of the 10th year assuming that the annual rate of compound interest on the investment capital is 4%. (10 points)

Problem number (2) (30 Marks)

a) The input fuel in (\$/h) for 3 generating units are given by: $F_1 = 22 + 12\,P_1 + 0.12\,P_1^2$, $F_2 = 50 + 9\,P_2 + 0.13\,P_2^2$ and $F_3 = 100 + 11\,P_3 + 0.08\,P_3^2$. Given that the load demand is 1200 MW and the power limits are: $150 \le P_1 \le 450$, $250 \le P_2 \le 800$, $60 \le P_3 \le 400$, find the optimal incremental fuel cost and the optimal allocation of load between the three units. (10 points)

b) Compare between the Hopkinson demand rate of two-part tariff and Doherty rate or three part tariff methods. (10 points)

P.T.O.

c) Consider a power system with two plants having incremental cost in LE/MW as: $\frac{dF_1}{dP_1} = 1.0\,P_1 + 200$ and $\frac{dF_2}{dP_2} = 1.0\,P_2 + 150$. The coefficients of the loss formula are: $B_{11} = 0.001$, $B_{22} = 0.0024$ and $B_{11} = 0.0005$ **considering the power in MW in the loss equation**. Find the optimum scheduling for a system load of 100 MW assuming a tolerance of 1%. Start with a lambda factor of 263 and penalty factors of 1.2 and 1.4 for the first and second units respectively. (10 points)

Problem number (3) (30 Marks)

a) Aided with neat sketches, Explain the methods used to improve the thermal efficiency of gas-turbine power plants. (10 points)

b) Explain in detail the main components of the hydraulic power plants. (10 points)

c) Discuss the operation principles of fuel cells. (10 points)

Good Luck

Course coordinator

Dr. Ahmed Refaat

قوى كهربية

Tanta University	Department of Power and Electrical Machines	Faculty of Engineering

Course Title: **Elective Course (1): Electrical Communications,**
Course Code: EEC3143, Students: **3rd year.**
Date: **Wed., 22-Jan.-2014,** Time Allowed: **Three hours,** No. of Pages: **1.**
Total Marks: **50**

Answer the following questions:

The first question [10 marks]

Calculate and sketch the magnitude spectrum for the following:

a. A periodic saw-tooth waveform with a period of π and with value of zero at $t = 0$ and value of one at $t = \pi$. Use the complex Fourier series expansion.
b. A non-periodic saw-tooth waveform with value of zero at $t = 0$ and value of one at $t = \pi$. Use the Fourier transform

The second question [15 marks]

Consider a modulating signal $m(t) = A_m \cos(2\pi f_m t)$ and a carrier signal $c(t) = A_c \cos(2\pi f_c t)$.

a. Find the equation of the Standard AM signal, Sketch the signal, and its spectrum.
b. Find the equation and sketch the signal and the spectrum of suppressed carrier AM signal.
c. Sketch a block diagram for generating the Lower SSB AM signals. What is the function of each block?

The third question [15 marks]

a. Show how to demodulate the following signals (sketch a block diagram or circuit with your answer):
   i. Standard AM signal.
   ii. DSB-SC AM signal.
   iii. SSB AM signal.

b. For an AM signal $s(t) = 2[1 + 0.5\cos(\omega_m t)]\cos(\omega_c t)$
   i. Find the modulation index, carrier amplitude and the modulating signal amplitude if $K_a = 0.2$
   ii. Find the average power of each component in its spectrum.

The fourth question [10 marks]

a. If the carrier signal is $c(t) = A_c \cos(2\pi f_c t)$ and the amplitude of the modulating signal $m(t)$ is very small. Show how you can obtain an FM signal. Draw a block diagram.
b. A receiver picked up an FM signal, $s(t) = 10\cos[10\pi \times 10^6 t + 0.7\sin(1600\pi t)]$. It is known that the modulating signal amplitude is 4 volts. Find:
   i. The frequency deviation, bandwidth and carrier power
   ii. Show the effect of changing modulating signal amplitude to 7 volts and frequency to 400 Hz.

Good Luck — Dr. Sameh A. Napoleon

Tanta University

Physics & Engineering Mathematics Department
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Engineering Mathematics (4) Course Code: PME3115 Date: 6/1/2014 Allowed time: 3 hrs
Year: Third year Electronics and Electrical Communications Engineering No. of Pages: 2

Remarks: (Answer the following questions. Assume any missing data...)

Problem number (1) (22 Marks; 8 + 7 +7)

(a) An urn contains seven black balls, five white balls and two red balls. If we draw three balls without replacement, what is the probability that they are of the same colour ?

(b) Seven fair coins are flipped. What is the probability that two heads are obtained ?

(c) Prove that if the random variable X has a binomial distribution with parameter n *and* p, then $\mu = np$ *and* $\sigma^2 = np(1-p)$.

Problem number (2) (23 Marks; 8 + 8+ 7)

(a) Consider the following density function:
$f(x) = ax$, $0 \le x \le 1$, $f(x) = 2 - x$ $1 \le x \le 2$ *and* $f(x) = 0$ *otherwise* . Then find
(i) a , (ii) the cumulative distribution function (iii) $p(0.2 < x < 1.2)$ *and* $p(x > 1.3)$

(b) A company has three plants to produce an electric relays with 50%, 30% and 20% respectively of its product. Suppose that the probabilities that a relay by these plants is defective are 0.02, 0.05 and 0.01 respectively. If a relay is selected randomly from the all output,
(i) what is the probability that it is defective?
(ii) if the selected relay is defective, what is the probability that it is from plant 2 ?

(c) In a manufacturing process that laminates several ceramic layer's, 1% of the assemblies are defective. A sample of 200 independent units is tracked for warranty performance. Find the probability that the sample has at least four defective units.

Problem number (3) (24 Marks; 8 + 8 + 8)

(a) Find the moment generating function of the exponential distribution, then from it find the mean and variance of this distribution.

(b) 500 ball bearings have a mean weight of 5.02 grams (g) and standard deviation of 0.3 g. Find the probability that a random sample of 100 ball bearing chosen from this group will have an average weight between 4.96 and 5.0 g.

(c) The following table gives degrees of 8 students in both the laboratory and lecture of physics

Laboratory x	8	3	9	2	7	10	4	6
Lecture y	9	5	10	1	8	7	3	4

(i) Draw a scatter diagram (ii) Compute r (ii) Find the regression line of y on x and y(5).

Problem number (4) (16 Marks; 8 +8)

(a)An automatic filling machine is used to fill bottles with oil. A random sample of 16 bottles results in a sample variance of fill volume of $S^2 = 0.0153$. Determine a 98% confidence interval for the variance.

(b) The brightness of a television picture tube can be evaluated by measuring the amount of current required to achieve a particular brightness level. A sample of 10 tubes results in $\overline{X} = 317.2$ *and* $S = 15.7$. Find (in micro amps) a 99% confidence interval on mean current required.

P.T.O. For tables **Good luck** **Dr. Manal Mohammed Hikal**

F(t)	0.9	0.95	0.975	0.99	0.995	0.999
df						
1	3.078	6.314	12.706	31.821	63.656	318.289
2	1.886	2.920	4.303	6.965	9.925	22.328
3	1.638	2.353	3.182	4.541	5.841	10.214
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.894
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646

T-distribution table

	0.01	0.025	0.05	0.95	0.975	0.99
df	Values of Chi-squared					
1	0.0002	0.0010	0.004	3.84	5.02	6.63
2	0.020	0.051	0.103	5.99	7.38	9.21
3	0.11	0.22	0.35	7.81	9.35	11.34
4	0.30	0.48	0.71	9.49	11.14	13.28
5	0.55	0.83	1.15	11.07	12.83	15.09
6	0.87	1.24	1.64	12.59	14.45	16.81
7	1.24	1.69	2.17	14.07	16.01	18.48
8	1.65	2.18	2.73	15.51	17.53	20.09
9	2.09	2.70	3.33	16.92	19.02	21.67
10	2.56	3.25	3.94	18.31	20.48	23.21
11	3.05	3.82	4.57	19.68	21.92	24.73
12	3.57	4.40	5.23	21.03	23.34	26.22
13	4.11	5.01	5.89	22.36	24.74	27.69
14	4.66	5.63	6.57	23.68	26.12	29.14
15	5.23	6.26	7.26	25.00	27.49	30.58
16	5.81	6.91	7.96	26.30	28.85	32.00
17	6.41	7.56	8.67	27.59	30.19	33.41

chi-squared table

TABLE III

Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4235	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Also, for $z = 4.0$, 5.0, and 6.0, the probabilities are 0.49997, 0.4999997 and 0.499999999.