University of Baghdad

College of Engineering

Electrical Eng. Dept.

Competitive Examination

Sunday 8-9-2013

Time: 3 Hours

Computer and Control Groups (M.Sc.)

Q_1: Using Routh's stability criterion, discuss the stability of a system given by its characteristic equation:

$$Q(s) = S^6 + 2S^5 + 8S^4 + 12S^3 + 18S^2 + 12S = -12$$

Q_2: Select the correct answer

1) Which layer 1 devices can be used to enlarge the area covered by single LAN segment ?
   A) Switches
   B) NIC
   C) Hubs
   D) RJ45 transceivers
2) When data is encapsulated which is the correct order?
   A) Data, packet, bits, segment , frame
   B) Data , bits, segment, packet, frame
   C) Data, segment, packet, bits, frame
   D) Data, segment, packet, frame, bits
3) What are the two purposes for segmentation with a bridge?
   A) To add more broadcast domains
   B) To create more collision domains
   C) To add more bandwidth for users
   D) To allow more broadcasts for users
4) What type of RJ45 UTP cable do you use to connect a PC's COM port to a router or a switch console port?
   A) Crossover
   B) Straight through
   C) Crossover with CSU/DSU
   D) Rolled

5) What protocol is used to find the hardware address of a local device?
   A) IP
   B) RARP
   C) ICMP
   D) ARP

Q_3: Given any positive integer not to exceed 16 bits and saved at address 33c00H. Write an **assembly** (8086) program to find how many adjacent ones are there in its binary form. Save result at address 44c00H.

Q_4: Choose the right answer for the following questions:

1. When an instruction is read from memory , it is called:
   a. Memory read cycle.
   b. Fetch cycle.
   c. Instruction cycle.
   d. Memory I/O cycle.
   e. None of the above.
2. In DMA, the data transfer is controlled by:
   a. Microprocessor.
   b. Memory.
   c. I/O devices.
   d. RAM.
   e. None of the above.
3. Tri state ICs are used to:
   a. Signal speed matching.
   b. Control of I/O direction.
   c. Circuit overload protection.
   d. Preventing noise.
   e. None of the above.

4. 8088 microprocessor differs from 8086 microprocessor in:
   a. support of MAX/MIN mode.
   b. Support of coprocessor.
   c. Data width in output.
   d. Address capability.
   e. All of the above.
5. The memory which is programmed at the time it is manufactured is:
   a. PROM.
   b. RAM.
   c. EPROM.
   d. ROM.
   e. All of above.

Q_5: A large number of consecutive IP address are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation.

Q_6: Give the expected output for the following program. Explain how you expect these results:

```
main()
{int a,b,c,result,x;
 a=0;b=1;c=0;x=10;
 result=a&&(x=100);
 printf("\ n x=%d      reslt=%d ",x);
 result=b || (x=200);
 printf("\ n x=%d      reslt=%d ",x);
 result=c&(x=300);
 printf("\ n x=%d      reslt=%d ",x);}
```

Q_7: Choose the right answer for each of the following sentences

1. An a.c. signal of constant voltage 10 V and variable frequency is applied to a simple high-pass RC filter. The output voltage at ten times the cutoff frequency would be
   (a) 1 V (b) 5 V (c) $10/\sqrt{2}$ (d) $10\sqrt{2}$

2. Transient current in an RLC circuit is oscillatory when
   (a) R=0 (b) R>√(L/C) (c) R<√(L/C) (d) R=√(L/C)
3. When an input voltage of 1 V is applied to an OP-AMP having $A_v=10^6$ and bias supply +15 V, the output voltage available is (a) $15*10^6$ V (b) 10^6 V (c) 15 μV (d) 15 V
4. When the elements of an RLC circuit are both magnitude-scaled and frequency-scaled, which quantity is unaffected?
   (a) Resistor (b) Resonant frequency (c) Bandwidth (d) Quality factor
5. Feedback in an amplifier always helps to
   (a) Control its output (b) Increase its gain (c) Decrease its input impedance
   (d) Stabilize its gain

Q_8: Choose the right answer for the following questions:

1. Amplitude modulation has
   a. one carrier
   b. one carrier with two side band frequencies
   c. one carrier with infinite frequencies
   d. none of these
2. Bandwidth of FM signal is —than AM signal
   a. lesser
   b. either lesser or larger
   c. larger
   d. none of these
3. In FM modulation ,when the modulation index increases, transmitted power is
   a. constant
   b. increased
   c. decreased
   d. none of these
4. The maximum power in AM, when modulation index is
   a. 0
   b. 0.5
   c. 0.7
   d. 1

5. The frequency range of 1GHZ to 30GHZ are referred as
   a. sound waves
   b. micro waves
   c. mini waves
   d. none of these

Q_9: Choose the right answer for the following questions:

1. The Jacobi's method is a method of solving a matrix equation on a matrix that has no zeros along its _____.
   a. main diagonal
   b. last column
   c. last row
   d. first row
2. To apply Simpson's 1/3 rule, the number of intervals in the following must be
   a. 2
   b. 3
   c. 5
   d. 7
3. In …… method, a system is reduced to an equivalent diagonal form using elementary transformations.
   a. Jacobi's
   b. Gauss-Seidel
   c. Relaxation
   d. Gaussian elimination
4. $\int \frac{dx}{1-x^2} =$
   a. $\frac{1}{2}[ln|1+x| + ln|1+x|] + C$
   b. $[ln|1+x| - ln|1+x|] + C$
   c. $[ln|1+x| + ln|1+x|] + C$
   d. $\frac{1}{2}[ln|1+x| - ln|1+x|] + C$

5. The angle between $u = i - 2j - 2k \quad and \quad v = 6i + 3j + 2k$ is:
   a. $\theta \approx 1.38 \ radians$
   b. $\theta \approx -0.19 \ radians$
   c. $\theta \approx 1.76 \ radians$
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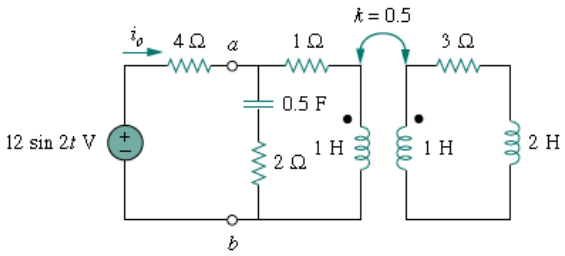
Q_{10}: For the circuit shown below find $\mathbf{Z}_{ab}$ and $\mathbf{I}_o$.



مع تمنياتنا لكم بالنجاح والموفقية

الهيئة التدريسية في قسم الهندسة الكهربائية

جامعة بغداد – كلية الهندسة

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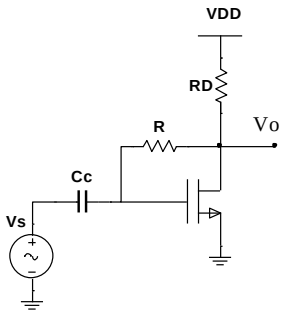
Electronics and Communications Groups (M.Sc.)

Q_1: Choose the right answer for the following questions:

1. Which of the following types of ADC circuits is the best to be used in designing measuring instruments (meters):
   a. Successive-approximations ADC.
   b. Tracking (or Servo) ADC.
   c. Dual-slope ADC.
   d. Flash ADC.
2. The inter-stage coupling capacitor between two stages is used
   a. To reduce (β) variations
   b. To block the dc voltage from the input of the 2^{nd} stage
   c. To perform impedance matching
   d. To increase the cutoff frequency of the 1^{st} stage
   e. To reduce the power dissipation in the 2^{nd} stage
3. The suitable amplifier required to form an oscillator in conjunction with a frequency selective network of 180o phase is
   a. Three stages Common Emitter amplifier
   b. Three stages Common Base amplifier
   c. Two stages Common Emitter amplifier
   d. Two stages Common Base amplifier
   e. Common Collector amplifier

Q_2: Make a full comparison between static and dynamic RAM circuits.

Q_3: For the feedback amplifier shown below determine the feedback topology and calculate *A, β and* A_f.



Q_4: Choose the right answer for the following questions:

1. If a sequence x(n) is multiplied by a complex exponential a^n . the Z-transform of a^n x(n) is:
   a. $X(a^{-1}z)$
   b. X(a z)
   c. X(z)/a
   d. $X(a^{-1}z)/a$
2. Suppose that $x_a(t)$ is strictly bandlimited so that $X_a(j\Omega) = 0$ for $|\Omega| > \Omega_o$. the sampling frequency of $x_a(t)$ must be:
   a. $\Omega_s \geq 2\ \Omega_o$
   b. $\Omega_s = 2\ \Omega_o$
   c. $\Omega_s < 2\ \Omega_o$
   d. $\Omega_s \geq \Omega_o$
3. A system is said to be shift –invariant if, for every delay n_o, the response to $x(n-n_o)$ is:
   a. $y(n- n_o)$
   b. $y(n+ n_o)$
   c. $y(n+2\ n_o)$
   d. $y(n-2\ n_o)$
4. The discrete-time Fourier transform (DTFT) of a sequence x(n), is defined as:
   a. $X(e^{j\omega}) = \sum_{-\infty}^{+\infty} x(n)e^{-jn\omega_o}$
   b. $X(e^{j\omega}) = \sum_{-\infty}^{+\infty} x(n)e^{jn\omega_o}$
   c. $X(e^{j\omega}) = \sum_{-\infty}^{+\infty} x(n)e^{-jn_o\omega}$
   d. $X(e^{j\omega}) = \sum_{-\infty}^{+\infty} x(n)e^{+jn_o\omega}$

5. Given two time domain signals x(n)with length N and y(n) with length of M. the length of z(n) = x(n) $*$ $y(n)$ where $*$ means convolution:
   a. N+M-1
   b. N-M-1
   c. N+M-2
   d. N+M

Q_5: Answer the following briefly:

a. Give an expression of the input impedance of the classical dipole
b. What is a fractal antenna?
c. Describe briefly the Yagi antenna.
d. Define the following: directivity, gain, antenna efficiency, pattern, and Fresnel zone.
e. What is difference between rectangular and circular wave guide?

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Q_7: By using Routh's Criterion, find the stability and the number of roots of the system that has the transfer function:

$$\frac{C(s)}{R(s)} = \frac{1}{s^5 + 2s^4 + 2s^3 + 4s^2 + 2s + 4}$$

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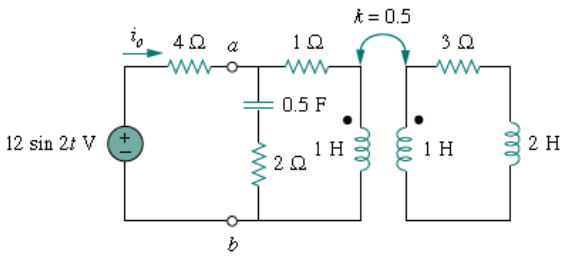

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Power and Machines Groups (M.Sc.)

Q_1: A 500V dc shunt motor has armature and field resistance of 1.5Ω and 400Ω respectively. When running on no loads the current taken is 5A and the speed is 1000rpm. Calculate the speed when motor is fully loaded and total current drawn from the supply is 30A. Also estimate the speed at this load if the shunt field current is reduced by 15%.

Q_2: Select the right choice for the following questions:

1. A three phase induction motor loaded with 1/4 full load. One line of the supply is opened while the motor is running. The motor will:
   a. Stops
   b. Slows down
   c. Runs with the same speed
2. A three phase induction motor, with no load, would runs at:
   a. Synchronous speed
   b. Subsynchronous speed
   c. Higher than synchronous speed
3. A split phase motor, would employ:
   a. Progressive windings
   b. Concentric windings
   c. D.C. windings
4. A three phase synchronous generator, would run normally in the region of:
   a. Under excitation
   b. Unity power factor
   c. Over excitation
5. A three phase synchronous motor, would run normally with a power factor:
   a. Leading
   b. Lagging
   c. Unity

Q_3: Answer the following Questions Briefly:

1. Name three methods used for starting three phase induction motors.
2. Give five different methods to turn on the thyristor.

Q_4: Choose the correct answer of the following:

1. The main purpose of a commutator in a dc machine is to:
   a. Increase output voltage
   b. Provide smoother output
   c. Reduce sparking at brushes
   d. Convert the induced ac to dc
2. Lap winding is suitable for……current ……..voltage dc generator
   a. high, low
   b. low, high
   c. low, low
   d. high, high
3. The critical resistance of the dc generator is the resistance of
   a. armature
   b. field
   c. load
   d. brushes
4. The essential condition for stable parallel operation. A two dc generators having similar characteristics is that they should have
   a. same kilowatt output ratings
   b. dropping voltage characteristics
   c. same percentage regulating
   d. same no-load and full load speed
5. Which of the following dc generator cannot build up on open circuit
   a. shunt
   b. series
   c. short-shunt
   d. long shunt

Q_5: Answer the following Questions Briefly:

1. Give four methods to improve the power factor for a single-phase fully controlled ac/dc converter.
2. Draw the circuit diagram of two snubber circuits used to protect a SCR during switching OFF and switching ON. Show the direction of currents for each case of switching.

Q_6: Give the correct answer for the following:

1. A 4-pole alternator, with 50Hz frequency will be driven at……..……. rpm?
   a. 1500
   b. 1800
   c. 3000
   d. 2400
2. The balanced faults that can be happening in the power system network are?
   a. Single line to ground
   b. Double line to ground
   c. Line-to-line
   d. Three phase
3. The classification of power system instabilities is summarized as
   a. Rotor angle stability
   b. Frequency stability and voltage stability.
   c. Voltage stability.
   d. Rotor angle stability, frequency stability and voltage stability.
4. In power system the Infinite Bus means.
   a. Constant load with constant voltage.
   b. Constant Voltage source only.
   c. Constant frequency only.
   d. A voltage source of constant voltage and constant frequency.
5. The salient pole rotors for synchronous generators can be found in.
   a. Nuclear power generators
   b. Gas turbine generators
   c. Steam turbine generators
   d. Hydro power generators

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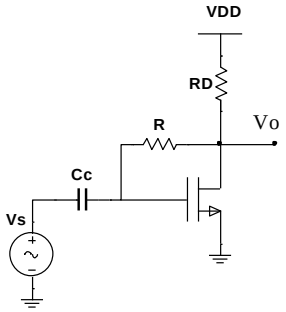

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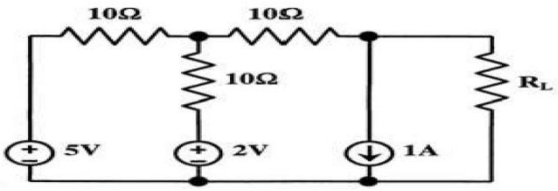
$$\frac{C(s)}{R(s)} = \frac{1}{s^5 + 2s^4 + 2s^3 + 4s^2 + 2s + 4}$$

Q_9: In the circuit shown below, find the value of R_L that satisfy the maximum power transfer.



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