

الاسم الكامل:

Wasit University  
College of Engineering  
Electrical Engineering Dept.  
Morning & Evening Studies  
Time: Three Hours  
Date: 13 June, 2019



College of Engineering

*Computer Architecture*  
*1<sup>st</sup> Attempt Final Examination*  
*Academic Year: 2018/2019*  
*Semester: 2<sup>nd</sup>*  
*Assist. Lec. Ahmed S. Alhuseiny*

**Attention: Attempt Four questions only.** The questions were chosen and reviewed carefully by a group of faculty members. Therefore, proctors are neither allowed to address a question nor give any explanation! However, if you find yourself and according to your assimilation you need more information, feel free to assume. The questions might be not applicable from the actual world perspective because they were adjusted in favor of students to fit the academic purposes and to measure their comprehension.

01

**[12.5 Credit Points]**

A coprocessor architecture has a built-in Booth multiplier circuit. Show the detailed steps of multiplying (3) by (-2). Support your answer with the algorithm flowchart.

02

**[12.5 Credit Points]**

- A) What is multiprocessor system? What is meant by loosely-coupled, distributed, memory system?
- B) It is required to design a multiprocessor system bus that interconnects Two CPUs with Four Memory Modules. Show the abstract level for your design using Multistage Switching Network

03

**[12.5 Credit Points]**

ASCII (U) with no parity checker is transferred through a conventional USB bus. Answer Two only **including A!**

### ASCII code chart

						0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1
Bits	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	Column Row	0	1	2	3	4	5
	0	0	0	0	0	NUL	DLE	SP	0	@	P
	0	0	0	1	1	SOH	DC1	!	1	A	Q
	0	0	1	0	2	STX	DC2	"	2	B	R
	0	0	1	1	3	ETX	DC3	#	3	C	S
	0	1	0	0	4	EOT	DC4	&	4	D	T
	0	1	0	1	5	ENQ	NAK	%	5	E	U
	0	1	1	0	6	ACK	SYN	&	6	F	V

- Show the timing diagram and every necessary detail.
- What topology and protocol the USB system uses?
- What is the maximum number of devices a USB can support?

Q4

**[12.5 Credit Points]**

- A) Show the pinout diagram of the PPI 82C55 and what is the content of Command Byte B to set bit zero of Port C?
- B) What is Endianness related with and how does little endian work?

Q5

**[12.5 Credit Points]**

- A) Coprocessors use IEEE 754 format. (Answer Two only including 3)
- 1- What does IEEE stand for?
  - 2- Why is IEEE 754 being used?
  - 3- Convert 3.75 to IEEE 754.
- B) What is Moore's Law? Support your assimilation with a demonstrative graph at the highest level.

~~4 All~~

*Teacher In charge*  
*Assist. Lec. Ahmed S. Alhuseiny*

Break a leg

and 2

*Department Head*  
*Lec. Dr. Manaf K. Abbas*



Final Second Term Exam 2018 – 2019

Answer 4 questions only. Each have (17.5 Mark)

- Q1: The switch in the circuit of fig.1 has been closed for a long time, and opens at  $t=0$ , using Laplace transform  
(A) Find  $i(t)$  for  $t > 0$   
(B) After how many milliseconds the current reach 60% of its initial value.

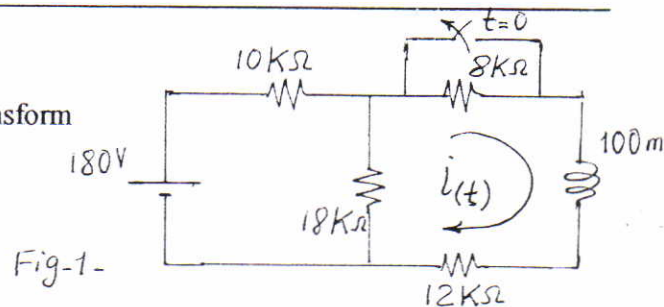


Fig-1-

- Q2: Find the current equation for the circuit of fig.2 if supply voltage is  
 $e = 20 + 15 \sin(2000t) + 10 \sin(4000t) \text{ volt}$

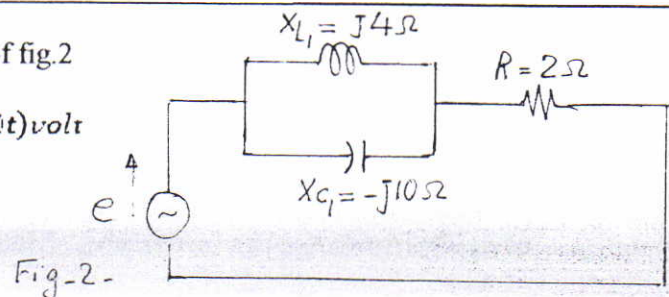


Fig-2-

- Q3: For the circuit in fig.3.  
Find the Z- parameters.

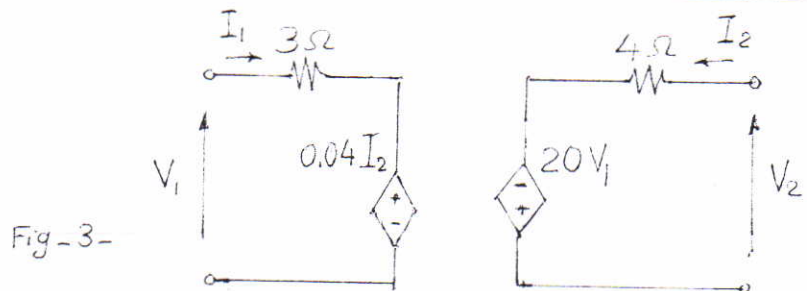


Fig-3-

- Q4: For the circuit of fig.4. Calculate the mutual inductance between two coils, and the total power consumed knowing that  $I_{5\Omega} = 0 \text{ Amp}$ .

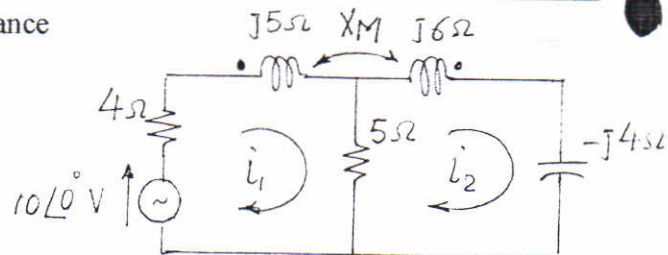


Fig-4-

- Q5: A balanced 3-φ, Y- connected load, has a line voltage of (380v), and a total power consumption of (1500w) at a leading power factor of (0.7).  
Find the impedance of each phase.

*Handwritten signature*

*Handwritten signature and text in Arabic*





Note: Answer all the questions, time is 3 hours

Q1.

- a) A binary source is emitting an independent sequence of 0's and 1's with probabilities of  $p(0)$  and  $p(1)$  respectively, plot the *entropy* of the source versus  $p$  and show that maximum entropy is achieved when  $p(0) = p(1)$ .
- b) The international Morse code uses a sequence of dots and dashes to transmit letters of the *English alphabet*, the dash is represented by a pulse of **3-units** duration and the dot is represented by **1-unit** duration, the probability of occurrence of a dash is  $1/3$  of a dot, find,
- The information content of a dash and a dot.
  - The average information in a dot-dash code.

12 Marks

Q2.

- a) For the following transition matrix, plot *channel model* and then find *channel capacity*

$$P(Y/X) = \begin{bmatrix} 0.9 & 0.1 & 0 \\ 0 & 0.1 & 0.9 \end{bmatrix}$$

- b) A transmitter has an alphabet consisting of 5-letters  $\{x_1, x_2, \dots, x_5\}$  and the receiver has an alphabet of 4-letters  $\{y_1, y_2, \dots, y_4\}$ , the joint probabilities of the system are shown as

$$P(X, Y) = \begin{bmatrix} 0.25 & 0 & 0 & 0 \\ 0.1 & 0.3 & 0 & 0 \\ 0 & 0.05 & 0.1 & 0 \\ 0 & 0 & 0.05 & 0.1 \end{bmatrix}$$

compute different entropies of this channel,  $H(X)$ ,  $H(Y)$ ,  $H(X, Y)$ ,  $H(Y/X)$ ,  $H(X/Y)$  and  $I(X, Y)$ .

12 Marks

3. In what direction does the phasor get rotated if it is multiplied by the operator 'a'?
- Anti clockwise
  - Clockwise
  - Gets rotated by  $90^\circ$  in the clockwise direction
  - Gets rotated by  $90^\circ$  in the anticlockwise direction
4. What is the value of the letter 'a' or 'α' which is commonly used in symmetrical components?
- $1 \angle 90^\circ$
  - $1 \angle 30^\circ$
  - $1 \angle 120^\circ$
  - $1 \angle -120^\circ$
5. A balanced three phase system consists of \_\_\_\_\_.
- Zero sequence currents only
  - Positive sequence currents only
  - Positive, negative and zero sequence currents
  - Only negative sequence currents
6. Why are series reactors used?
- Improve the transmission efficiency
  - Improve the power factor of the power system
  - To bring down the fault level with in the capacity of the switchgear instrument
  - All of these
7. What are zero sequence components?
- Three balanced phasors of equal magnitude and displaced by  $120^\circ$
  - Three balanced phasors displaced by  $120^\circ$  and having phase sequence opposite to that of the original phasors.
  - Three phasors with equal magnitude and zero displacement.
  - None of these
8. What does the positive sequence component consist of?
- Three balanced phasors of equal magnitude and displaced by  $120^\circ$
  - Three unbalanced phasors displaced by  $120^\circ$
  - Three phasors with equal magnitude and zero displacement.
  - None of these

**B-**

A three phase alternator 50 MVA, 11KV, exposure to types of faults are following:





Answer Five Questions only

Q1 ) [12+8 Marks]

A- Chose the correct answer (Answer six only)

1. Per unit of any quantity is defined as
  - a. actual value of quantity /base value of quantity in same units ✓
  - b. actual value of quantity /base value of quantity in different units
  - c. base value of quantity /actual value of quantity in same units
  - d. base value of quantity /actual value of quantity in different units
2. A generator has a rating of 10 MVA, 5 kV has a reactance of 0.02 pu. Find the reactance at a new base values of 50 MVA, 10 kV?
  - a. 0.02
  - b. 0.025
  - c. 0.05
  - d. 0.25
3. The voltage and current instantaneous values are given as  $5 \sin(\omega t + 30^\circ)$  pu and  $2 \sin(\omega t - 15^\circ)$  pu respectively. Find the per unit active power?
  - a. 5 pu
  - b. 3.535 pu
  - c. 5.353 pu
  - d. 7 pu
4. The per unit impedance of a circuit element is 0.30. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be
  - a. 0.30
  - b. 0.60
  - c. 0.0030
  - d. 0.0060
5. Three generators rated 100 MVA, 11 kV have an impedance of 0.15 pu each. If in the same plant, these generators are being replaced by a single equivalent generator, the effective impedance of equivalent generator will be
  - a. 0.15 pu
  - b. 0.45 pu
  - c. 0.05 pu
  - d. 0.25 pu
6. When series reactor is used in generating stations, the fault current magnitude is
  - a. increased
  - b. reduced
  - c. remains unaffected
  - d. any of the above
7. An isolated synchronous generator with transient reactance equal to 0.1 pu on a 100 MVA base is connected to the high voltage bus through a step up transformer of reactance 0.1 pu on a 100 MVA base. The fault level at the bus is
  - a. 100 MVA
  - b. 200 MVA
  - c. 500 MVA

### **fault faults**

5. Basic quantity measured in a distance relay is

- a) Impedance b) Current difference c) Voltage difference d) None of these

6. Which of following are the desirable qualities of protective relays?

- a) Stability, reliability b) Speed sensitivity c) Selectivity, adequacy d) None of these

7. Protective relays are devices which detect abnormal conditions in electrical circuit by measuring

- a) Current during abnormal condition b) Voltage during abnormal condition c) Both (a) and (b) simultaneously d) Constantly the electrical quantities which differ during normal and abnormal conditions

8. A distance relay measures

- a) Current difference b) Voltage difference c) Impedance difference d) Distance between two CT's

### **B.**

A 50 Hz, 11 kV, 3-phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to a bus-bar through a circuit breaker. The distributed capacitance up to circuit breaker between phase and neutral is  $0.01 \mu\text{F}$ . Determine

(i) peak re-striking voltage across the contacts of the breaker

(ii) frequency of oscillations

(iii) the average rate of rise of re-striking voltage up to the first peak

### **Q 6: [12+8 Marks]**

**A- Answer only six:**

1. A single phasing relay can be used with
  - a)  $1\phi$  motor, b)  $2\phi$  motor, c)  $3\phi$  motor, d) All of these.
2. In impedance relay, current element torque should be
  - a) Equal to voltage element torque ✓
  - b) Greater than voltage element torque
  - c) Less than voltage element torque
  - d) None of these.
3. Distance relays are generally
  - a) Impedance type
  - b) MHO type ✓
  - c) Reactance type
  - d) All of these
4. Buchholz relay is used to protect against
  - a) Inter-turn fault
  - b) External faults
  - c) Rotor faults
  - d) Every internal faults
5. An impedance relay is used for
  - a) Earth faults
  - b) Interphase faults
  - c) Both (a) and (b)
  - d) None of these
6. Relay gets its operating energy from

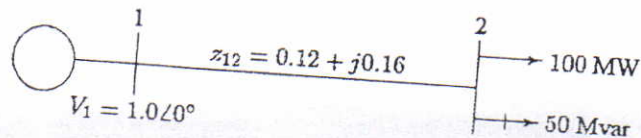
$$\frac{11}{\sqrt{3}} = 2$$
$$2 \quad 2$$



- a. P and Q
  - ☒ b. P and  $|V|$
  - c. Q and  $|V|$
  - d. P and  $\delta$
7. Which among the following quantities are specified at the load bus?
- a. P and Q
  - ☒ b. P and  $|V|$
  - c. Q and  $|V|$
  - d. P and  $\delta$
8. Why are load flow studies carried out?
- a. To study of stability of the system
  - b. For fault calculations
  - c. For planning the power system
  - ☒ d. All of these

**B-**

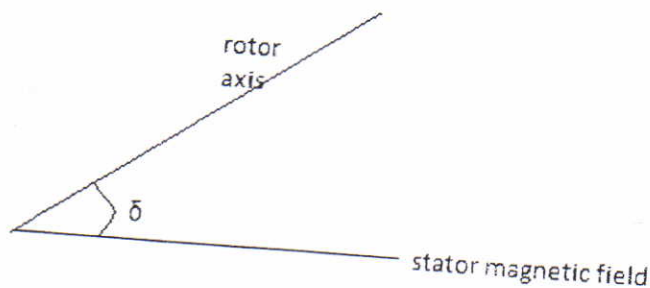
In the two-bus system shown in Figure below, bus 1 is a slack bus with  $V_1 = 1.06 \angle 0$  p.u. A load of 100MW and 50 Mvar is taken from bus 2. The line impedance is  $Z_{12} = 0.12 + j0.16$  p.u on a base of 100 MVA. Using Newton-Raphson method, obtain the voltage magnitude and phase angle of bus 2. Start with an initial estimate of  $|V_2|^{(0)} = 1.0$  p.u and  $\delta_2^{(0)} = 0$ . Perform one iteration.



**Q 4: [12+8 Marks]**

**A- Answer only six:**

1. The synchronous machine is operating at a normal condition at the generating system, then the angle between rotor axis and the stator magnetic axis is \_\_\_\_\_.
- a) Load angle
- b) Power factor angle
- c) Impedance angle
- d) None of the mentioned
2. The angle shown in the figure depends on which of the following given options?



- a) Loading of the system
  - b) Power factor
  - c) Operating frequency
  - d) Power factor, operating frequency, loading of the system
3. Swing equation is very famous for describing the relation between the \_\_\_\_\_.
- a) rotor motion and stator field
  - ☒ b) stator and rotor field



Second course examination – First attempt 2018-2019

∴ A) Use integration by parts to evaluate the integral.

(10 Marks)

$$\int x^2 e^x dx$$

B) Solve only two from the following by using tabular integration.

(10 Marks)

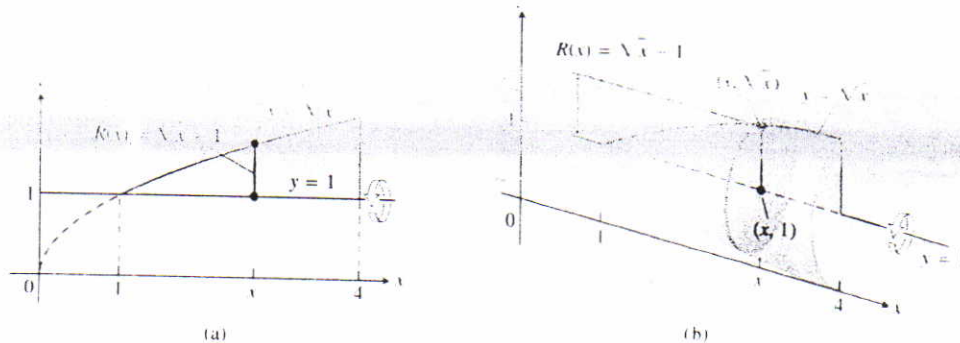
1)  $\int x^3 \sin x dx$

2)  $\int x^3 e^x dx$

3)  $\int (x^2 - 5x + 2) \cos x dx$

Q2: A solid revolution (rotation about the line  $y = 1$ ) find the volume of the solid generated by revolving the region bounded by  $y = \sqrt{x}$  and the lines  $y = 1$ ,  $x = 4$  about the line  $y = 1$ .

(20 Marks)



Q3: Solve only one (A or B) of the following integrals by using trigonometric substitutions.

(15 Marks)

(A)  $\int \sqrt{25 - t^2} dt$  ..... (when  $t = a \sin \theta$ )

(B)  $\int \frac{dy}{\sqrt{9 - y^2}}$  ..... (when  $y = a \tan \theta$ )

Q4: Consider the following system of linear equations.

(15 Marks)

$$2x + 3y + z = -1$$

$$3x + 3y + z = 1$$

$$2x + 4y + z = -2$$

(a) Find the matrix A for this system.

(b) Find the inverse matrix of the matrix found in (a).

(c) Solve the system using the inverse matrix.

Assist lecture. Firas Naji Obaid

Good luck



- 1) 1- A communication System has the following data:

Parameter	Value
Distance between receiving and transmitting antennas	2000 km
Ionosphere layer height	400 km
Maximum usable frequency of the ionosphere layer	40 MHz

Find the critical frequency of the ionosphere layer used for reflecting the wave directed from the transmitter antenna to the receiver antenna.

- 2- Find the refractivity of troposphere if ( $P = 500$  mb,  $p = 10$  mb,  $T = 300$  K).
- 3- Find the distance between two communication points uses the VHF frequencies as line of sight propagation, if the first and second tower heights are 50 and 200 m, respectively and the earth radius is 6400 km.
- 4- Find the beamwidth of the parabolic antenna of diameter (10 meter) operating at frequency of (10 GHz).
- 5- Find the refractive index of the ionosphere layer having an electron density of ( $2 \times 10^{10}$  electrons/ $m^3$ ) and the wavelength of incident wave is (10 m).

15 Marks

Q4)

- 1- What are the advantages of the satellites communications?
- 2- Define the generations of satellite systems.
- 3- Why there is a need to use of elliptical orbits in place of circular orbits for geostationary satellites?

10 Marks

- Q5) A satellite in geostationary orbit at (36000 km) has a (4 GHz) downlink transmitter which feeds (5W) into an antenna with (30 dB) gain. The ground station receiving antenna is parabola with diameter of (10 m), if the system operating over (20 MHz) signal band. Find (i) the noise figure of the ground receiving system necessary for maintaining (30 dB) input signal to noise ratio, (ii) The link attenuation. ( $k = 1.38 \times 10^{-23}$ ,  $T_o = 290K$ ).

10 Marks

Note: (1 GHz =  $1 \times 10^9$ ), (1 MHz =  $1 \times 10^6$ )

Good Luck.



Answer all the questions

Q1) Answer by true or false for ten of the following items, and correct the false one.  
1- In an array antenna, when the spacing between elements is  $\lambda/2$ , the steering of beam is restricted to about  $\pm 50^\circ$ .

2- In an array antenna, the phase shifters are used to reduce sidelobes.

3- The larger the antenna aperture leads to greater gain and wider beamwidth.

4- The smooth walls horn antenna has smaller sidelobe level compared to corrugated horn antenna.

5- The parabolic surface, which is obtained by rotating a parabolic curve on its axis, satisfies the equation ( $y = 6fx$ ).

6- Typical methods used for array synthesis are, the cosine tapering and cosine squared tapering

7- The condition for bending the electromagnetic waves down to earth is curvature of the earth.

8- The main reason that causing travelling wave attenuation, is the presence of ionized layers.

9- The reception of long sky wave is better through the night than the daytime because of the radiation of the sun.

10- The propagation of short sky wave depends on some factors, which are eddy currents, clouds, and gamma rays.

11- The methods used for VHF propagation are tropospheric scatter, ionospheric scatter, and meteor trails.

12- Trapping usually occurs at millimeters wavelengths.

13- Ionization columns produced by meteors in the E-layer region are capable of reflecting waves. The meteor trails are either of high density or of low density. The probability of occurrence of the latter is high.

20 Marks

Q2) A satellite communication system operates at a frequency ( $f=12$  GHz) with a spherical balloon of equivalent echoing area ( $5 m^2$ ) and identical antennas of (40 dB) gain for transmission and reception. The transmitter power is (10 kW), the receiving antenna noise temperature is (30 K) and the receiver noise temperature is (40 K), the distances from the balloon to the receiving and transmitting antennas are 2000 and 3000 km respectively. Calculate; (i) the link attenuation (ii) the field strength at the receiver, and (iii) the signal-to-noise ratio at the receiver output, assuming a receiver bandwidth of 20 kHz. ( $k = 1.38 \times 10^{-23}$ ,  $T_o = 290K$ ).

15 Marks





Q1/A) Answer **ONE** of the following

(6 marks)

1. Explain the TCP/IP model.
2. List all steps need for networks to encapsulate data

B) Consider a LAN with a maximum distance of 2 km. At what bandwidth would propagation delay (at a speed of  $2 \times 10^8$  m/s ) equal transmit delay (insertion delay) for 512 byte packets? What about 2000 byte packets? (5 marks)

Q2/ Answer **SEVEN** of the following

(28 marks)

1. Which subnet does host 192.168.233.201/29 belong to?
2. What valid start host for IP address 192.168.211.142/28 ?
3. What is the broadcast address of the network 172.30.140.0 255.255.254.0?
4. What is the last valid host on the subnetwork 172.17.104.0 255.255.248.0?
5. How many hosts per subnet can you get from the network 172.20.0.0/27?
6. What is the last valid host on the subnetwork 172.21.148.32 255.255.255.224?
7. Which subnet does host 192.168.128.148/25 belong to?
8. What is maximum host address of the IP address 172.23.220.6/20 a part of?

Q3) Answer **TEN** of the following

(21 marks)

1. What is the VRC value for (77 6F 72 6C 64) message?
2. Compute the CRC-4 character for the message (11010111101001) using a "divisor" constant of 11001:
3. Find the checksum of the following bit sequence. Assume a 16-bit segment size. 939B D8C5 A345 D2BC
4. Suppose we want to transmit the message 1001101001011011 and protect it from errors using the CRC8 polynomial  $x^8 + x^2 + x^1 + 1$ . Use polynomial long division to determine the message that should be transmitted.
5. Compute the CRC code given the message 1101010011 and the pattern 10011. Verify that the code is correct.
6. Assume that a receiver receives the following bit sequences. An 8-bit check sum is used. Which sequences will be received correctly? (a) 10010011 10011010 11011001 (b) 00110011 10111111 00010101
7. Show the bit pattern transmitted for the message 1110101 1010110 1010111 using a Hamming code
8. A Hamming code whose value is (10110011110 11001111111 11111111110) arrives at a receiver. What was the original value that sent?





All the questions has equal marks

Q1) answer one of the following items

a) In the region of free space where,  $2 \leq r \leq 3$ ,  $0.4\pi \leq \theta \leq 0.6\pi$ ,  $0 \leq \phi \leq \pi/2$ , let  $\mathbf{E} = k/r^2 \mathbf{a}_r$ . Find a positive value for  $k$  so that the total energy stored is exactly (1 Joule).

b) Let  $V = xy^2z$ . calculate the energy expended in transferring a  $2 \mu\text{C}$  point charge from  $(1, -1, 2)$  to  $(2, 1, -3)$ .

c) A point charge of  $4 \text{ pC}$  is located at the origin in free space. Find the potential at  $(r=4 \text{ m})$  if the zero reference is at  $(2 \text{ m})$ .

Q2) A dipole at the origin in free space has a moment of  $2000\pi(0.6\mathbf{a}_x - 0.75\mathbf{a}_y + 0.8\mathbf{a}_z) \text{ C.m}$ . Find the potential at  $P(0,0,5)$ .

Q3) A uniform line charge  $\rho_l = 2 \frac{\text{nC}}{\text{m}}$  lies in the  $(z=0)$  plane parallel to the  $x$ -axis at  $y=3 \text{ m}$ . find the potential difference  $V_{AB}$  for the points  $A(2,0,4)$  and  $B(0,0,0)$ .

Q4) answer two of the following items.

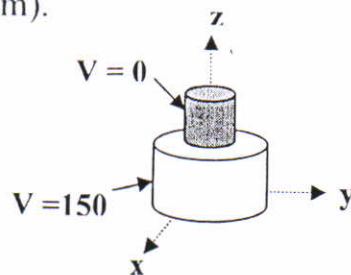
a) It is known that the potential is given as  $V = 80r^{0.6} \text{ v}$ , Assuming free space conditions, Find  $V$ ,  $\mathbf{E}$ , and  $\rho_v$  at  $r=0.5 \text{ m}$ .

b) Given  $\mathbf{J} = 10z \sin^2 \phi \mathbf{a}_r \text{ A/m}^2$ , find the current through the cylindrical surface,  $r=2$ ,  $1 \leq z \leq 5 \text{ m}$ .

c) A wire of diameter of  $2 \text{ mm}$  and length of  $100 \text{ m}$ , when it is connected across  $10 \text{ V}$  supply, a current of  $3.14 \text{ A}$  is flow through it. If the drift velocity of the electrons is  $5 \times 10^{-5} \text{ m/sec}$ , find; (i) the electric field intensity  $\mathbf{E}$ , (ii) the current density  $\mathbf{J}$ , (iii) the charge density of free electrons  $\rho_v$ , (iv) the conductivity  $\sigma$ .

Q5) answer one of the following

a) find the potential function and the electric field intensity for the region between two concentric right circular cylinders as shown in figure 1, where  $(V=0)$  at  $(r=1 \text{ mm})$  and  $(V=150 \text{ V})$  at  $(r=20 \text{ mm})$ .



b) let  $(\mathbf{A} = (3y - z)\mathbf{a}_x + 2xz\mathbf{a}_y) \text{ Wb/m}$  in a certain region of free space. Find;  $\mathbf{A}$ ,  $\mathbf{B}$ ,  $\mathbf{H}$ , and  $\mathbf{J}$  at  $P(2, -1, 3)$ .

Good Luck.

*[Signature]*

*[Signature]*





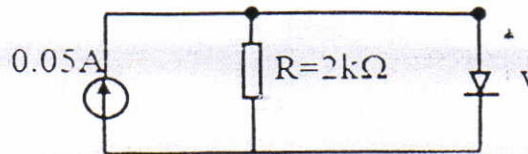
Q1: The vertical distance covered by a rocket from  $t=8$  to  $t=30$  second is giving by

$$x = \int_8^{30} (2000 \ln \left[ \frac{140000}{140000 - 2100t} \right] - 9.8t) \cdot dt \quad [15 \text{ marks}]$$

- Use trapezoidal rule to find the distance using two segments ( $n=2$ ).
- Find the true error in (a).
- Use Simpson's rule to find the distance using four segments ( $n=4$ ).

Q2: A) Solve the differential equation  $\frac{dy}{dt} = 3te^{-y}$  using Euler method up to  $y(0.6)$ , with step size  $h=0.2$  and  $y(0)=2$ , then calculate the error. [10 marks]

B) Use Newton Raphson method to find the value of  $v$  if the diode current is  $i=10^{-15}(e^{38v} - 1)$ , use  $v(0)=0$ , calculate up to 4 iterations. [5 marks]



Q3: A) Use Runge Kutta method to solve the D.E  $\bar{y}' = y + x^2$ , where  $y(0)=1$ ,  $h=0.025$  and  $n=5$  and calculate the error if the exact solution  $y(x_n) = 3e^{x+x^2} - 2x - 2$ . [10 marks]

B) Let  $f(z) = y - 2xy + i(-x + x^2 - y^2) + z^2$  where  $z$  is a complex variable defined in the whole complex plane. Where is the Cauchy-Riemann equation satisfied? [5 marks]

Q4: Solve the following:

- The value of  $\int_0^\infty e^{-3t} \cdot t \cdot \sin 2t \cdot dt$  using Laplace transform. [15 marks]
- The Laplace transform of  $\mathcal{L}\{t^2 \cdot e^t \cdot \cos t\}$ .
- Find L.T  $\mathcal{L}\{\sin^2 t\}$  using differential property.

Q5: A) Consider the random variable  $x = \cos(\omega t + \alpha)$ , where  $\alpha$  is a random variable with uniform probability density function over  $-\pi \leq \alpha \leq \pi$ . Compute mean, mean square value, and variance.

B) A box contains 5 green balls and 7 yellow balls. Two balls are chosen at random from the box without replacement. What is the probability they are different colors? [10 marks]

Examiner: *Dr. Manaf K. Al-Taleb*

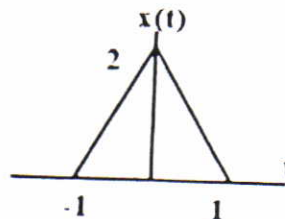
Good Luck

Q1: The vertical distance covered by a rocket from  $t=8$  to  $t=30$  second is giving by [5 marks]

$$x = \int_8^{30} (2000 \ln \left| \frac{140000}{140000 - 2100t} \right| - 9.8t) * dt$$

Use trapezoidal rule to find the distance using two segments ( $n=2$ ).

B) Find the Fourier transform for  $f(t) = 2(1-t)$ , where  $0 \leq t \leq 1$



[15 marks]

Q2: A). Solve the differential equation  $\frac{dy}{dt} = 3te^{-y}$  using Euler method up to  $y(0.6)$ , with step size  $h=0.2$  and  $y(0) = 2$  and calculate the error [10 marks]

Q3: A) : Given that  $H(z) = \frac{z+1}{z^2-2z+3}$  represents a causal system. Find the difference equation and draw the realization structure. [10 marks]

Q4: Solve two of the following:

- 1) The value of  $\int_0^{\infty} e^{-3t} \cdot t \cdot \sin 2t \cdot dt$  using Laplace transform.
- 2) The Laplace transform of  $\mathcal{L}\{t^2 \cdot e^t \cdot \cos t\}$ .
- 3) Find the Z-transform including the region of convergence of  $x(n) = a^n u(n) - b^n u(-n-1)$

[10 marks]

Q5: A) Let  $f(z) = y - 2xy + i(-x + x^2 - y^2) + z^2$  where  $z$  is a complex variable defined in the whole complex plane. Where is the Cauchy-Riemann equation satisfied? [5 marks]

B) A box contains 5 green balls and 7 yellow balls. Two balls are chosen at random from the box without replacement. What is the probability they are different colors? [5 marks]

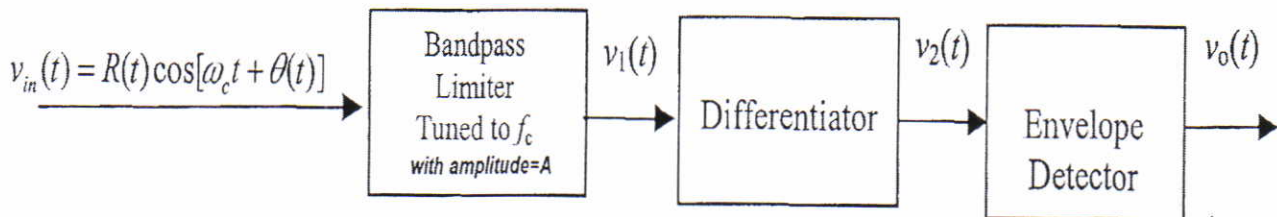
Examiner: Dr. Manaf K. Al-Taleb

Good Luck



**Q5 :**

- (a) Find the input impedance  $Z_{in}$  of electrically small transmission line, where its length  $\ell$  is small with respect to signal wavelength. The line is terminated by a load impedance of  $Z_L$ .
- (b) A frequency modulation detector is obtained by using an envelope detector as shown below. If the input  $v_{in}(t)$  is a bandpass signal having envelope  $R(t)$  and phase  $\theta(t)$ , give  $v_1(t)$ ,  $v_2(t)$  and  $v_o(t)$ .



**20 Marks**

**Q6 :**

- (a) If a voice signal has a bandwidth of 4 kHz and peak value of 2 volt. It is sampled at the rate of 32000 samples/sec by using a delta modulator, determine
- the value of step size  $\Delta V$  to avoid slop overload.
  - the quantization noise power  $N_q$ .
  - signal to quantization noise ratio.
- (b) A transmission line operated at 1 kHz, it has  $R=10 \text{ ohm/km}$ ,  $L=4 \text{ mH/km}$ ,  $C=0.008 \text{ uF/km}$  and  $G=0.4 \text{ uS/km}$ . Determine
- characteristic impedance.
  - propagation constant.
  - attenuation constant.
  - phase constant.

**20 Marks**

**Good Luck**

*Dr Basim Khalaf*



---

---

**Answer 5 Questions Only including Q1.**

**Q1 :** Choose one of the different cases indicated in the parenthesis so that the preceding sentence has correct meaning. **[Select only 10 from the following list]**

- a) A particular 15 kHz single tone modulating signal results in a peak frequency deviation of 75 kHz. What is the modulation index? (5, 15, 75, 3)
- b) The preemphasis circuit emphasizes the (*Lower Frequency, Higher Frequency, Middle Frequency, All Frequency*) components of the modulating signal.
- c) The frequency of the stereo sub carrier signal in FM broadcasting is (19 kHz, 45 kHz, 55 kHz, 38 kHz).
- d) A signal is sampled at 8 kHz and is coded by using an 8-bit PCM coder. Assuming SNR<sub>q</sub> for a sinusoidal signal, the correct statement for PCM signal with a bit rate of R is (*R=32 kbps & SNR<sub>q</sub>=25.8 dB, R=64 kbps & SNR<sub>q</sub>=49.8 dB, R=64 kbps & SNR<sub>q</sub>=55.8 dB, R=32 kbps & SNR<sub>q</sub>=49.8 dB*).
- e) If the number of bits per sample in a PCM system is increased from n to (n+1), the improvement in signal to quantization noise ratio will be (3 dB, 2n dB, 6 dB, n dB).
- f) The minimum sampling rate to avoid aliasing when a continuous time signal is given by  $x(t)=5\cos 400\pi t$  is (100 Hz, 200 Hz, 400 Hz, 250 Hz).
- g) An analog voltage in the range 0 to 8 V is divided in 16 equal intervals for conversion to 4-bit PCM digital output. The maximum quantization error (in V) is (0.25, 0.5, 0.75, 0.125).
- h) A bandlimited signal is sampled at the Nyquist rate. The signal can be recovered by passing the samples through (*an RC filter, an envelope detector, a PLL, an ideal low-pass filter with the appropriate bandwidth*).
- i) The reflection coefficient (K) and VSWR values of the line terminated by  $Z_L=Z_o$  are (1 &  $\infty$ , 0 & 1, 0 &  $\infty$ ,  $\infty$  & 1).
- j) When a transmission line has a load impedance same as that of its characteristic impedance, the line is said to be (*Open end, Shorted, Not matched, Matched*).
- k) When a continuous time signal is given by  $x(t)=5\cos 100\pi t+10\cos 200\pi t-15\cos 300\pi t$ , the Nyquist rate for sampling is (300Hz, 600Hz, 150Hz, 200Hz).
- l) The compression in PCM refers to relative compression of (*higher signal amplitudes, lower signal amplitudes, lower signal frequencies, higher signal frequencies*).

---

**20 Marks**



Wasit University, Faculty of Engineering

Electrical Engineering Department

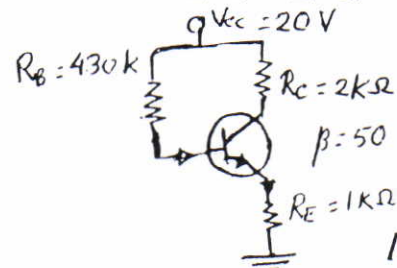
1<sup>st</sup> year: Physical Electronics

Final 2<sup>nd</sup> course 1<sup>st</sup> attempt Exam 2018-2019



Time: 3 Hours

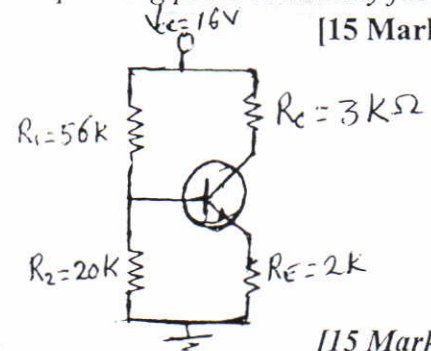
Q1// For the emitter-biase Si-transistor circuit shown; calculate:  $I_B$ ,  $I_C$ ,  $V_{CB}$ ,  $V_B$ , &  $V_C$ . [15Marks]



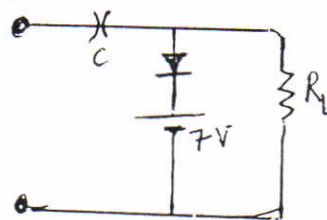
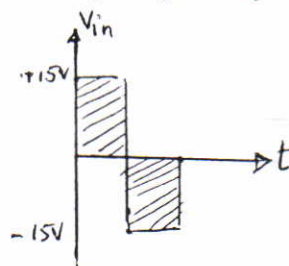
Q2// Answer four only

- A. State the zener diode specifications. B. Prove that  $\beta = \alpha / 1 - \alpha$   
C. List the applications of Tunnel Diodes, D. State the disadvantages of LEDs & E. Why Si & Ge are not used in LED?

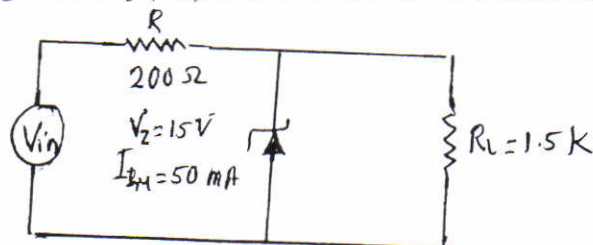
Q3// In Ge-transistor self-biased given  $\alpha = 0.985$ . Determine: operating point & stability factor [15 Marks]



Q4// Sketch the output waveform for the following circuit.



Q5// Determine the range value of ( $V_{in}$ ) that will maintain the zener diode ON state for the circuit. [15 Marks]



a) 0.138 s

b) 0.342 s

c) 0.812 s

d) 0.132 s

8- the number of inputs in astable circuits is -----

a) 1

b) 2

c) 0

d) none of the previous

(12 Marks)

b- Draw the internal circuit of 555 timer connected as astable multivibrator? Then calculate the circuit parameters so that the output signal have 1KHz frequency with 60% duty ration?

(8 Marks)

Q 2- a- Answer only six:

(12 Marks)

1. For what combinations of the inputs D and EN will a D latch reset?
  - (a) D = LOW, EN = LOW
  - (b) D = LOW, EN = HIGH
  - (c) D = HIGH, EN = LOW
  - (d) D = HIGH, EN = HIGH
2. A flip-flop changes its state during the
  - (a) complete operational cycle
  - (b) falling edge of the clock pulse
  - (c) rising edge of the clock pulse
  - (d) both answers (b) and (c)
3. A feature that distinguishes the J-K flip-flop from the D flip-flop is the
  - (a) toggle condition
  - (b) preset input
  - (c) type of clock
  - (d) clear input
4. The output of a Mealy state machine depends on its
  - (a) inputs
  - (b) next state
  - (c) present state
  - (d) answers (a) and (c)
5. The group of bits 10110101 is serially shifted (right-most bit first) into an 8-bit parallel output shift register with an initial state of 11100100. After two clock pulses, the register contains
  - (a) 01011110
  - (b) 10110101
  - (c) 01111001



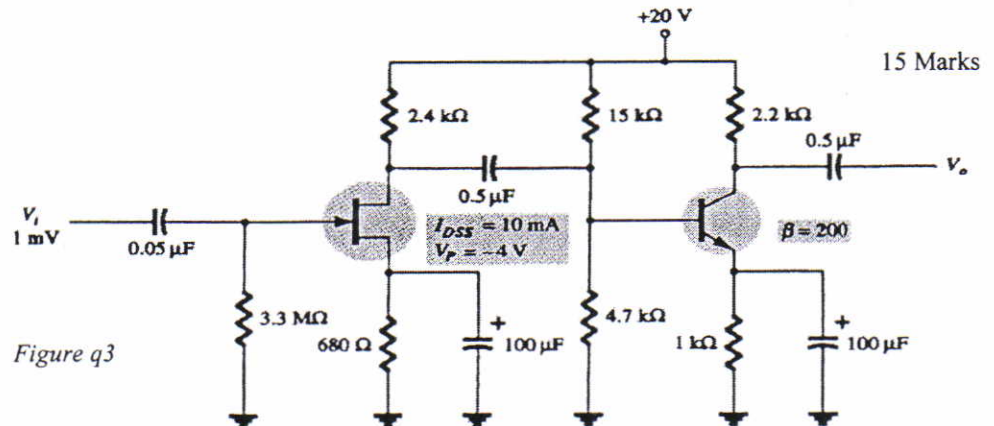
Note: Answer only five questions.

1- Answer Only Six:

- 1- The input in monostable circuit using 555 timer is connected to ----- pin of 555 timer
  - a) Cntr
  - b) trig
  - c) thresh
  - d) res
- 2- If  $R_a=R_b=1K\Omega$  and  $c=1\mu F$ , then the duty cycle of the output signal in 555 timer astable circuit is -----
  - a) 66.7%
  - b) 69.4%
  - c) 72.3%
  - d) 56.3%
- 3- The flip flops are
  - a) Astables
  - b) monostables
  - c) bistables
  - d) none of the previous
- 4- The circuits of monostables are also called -----
  - a) One shot
  - b) triggered circuit
  - c) pulsed circuit
  - d) none of the previous
- 5- If  $R=10 K\Omega$  and  $C=10 \mu F$ , then the output period in 555 timer monostable is -----
  - a) 0.11 s
  - b) 1.2 s
  - c) 0.2 s
  - d) 0.15 s
- 6- If  $R_a=R_b=1K\Omega$  and  $c=1\mu F$ , then the frequency of the output circuit in 555 timer astable circuit is -----
  - a) 0.52KHz
  - b) 1.21KHz
  - c) 0.48 KHz
  - d) 0.24KHz
- 7- In astable 555 timer circuit, if  $R_a=R_b=10K\Omega$  and  $c=10 \mu F$ , then the high time period will be -----

Q3.

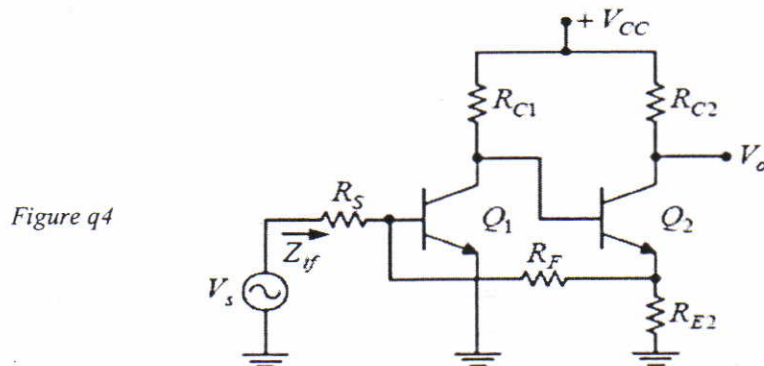
For the cascade amplifier of figure q3, calculate the voltage gain, output voltage, input impedance, and output impedance. Determine the resulting output voltage if we connect  $15\text{k}\Omega$  load to the output.



Q4.

The Feedback amplifier of Figure Q3 has the following parameters:  $R_{C1} = 3\text{ k}\Omega$ ,  $R_{C2} = 0.5\text{ k}\Omega$ ,  $R_{E2} = 50\text{ }\Omega$ ,  $R_f = R_s = 1.2\text{ k}\Omega$ ,  $h_{ie} = 1.1\text{ k}\Omega$ ,  $h_{fe} = 50$ , and  $h_{re} = h_{oe} = 0$ .

Find  $A_{vf}$  and the impedance seen by the voltage source



Dr. Ismail Sh. Bager

Good luck



Note: Answer 3- questions only, time is 3 hours

**Q1.**

- a) For the common-gate configuration of figure q1-a.  
Determine  $V_{GSQ}$ ,  $I_{DQ}$ ,  $V_D$ ,  $V_G$ ,  $V_S$ , and  $V_{DS}$

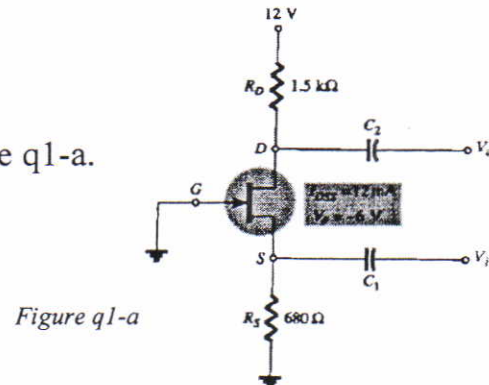


Figure q1-a

- b) The fixed-bias configuration network of figure q1-b had an operating point defined by  $V_{GSQ} = -2V$  and  $I_{DQ} = 5.625 \text{ mA}$ , with  $I_{DSS} = 10 \text{ mA}$ ,  $V_P = -8 \text{ V}$ , and  $r_d = 25K\Omega$ . Determine  $g_m$ ,  $Z_i$ ,  $Z_o$ , and the voltage gain  $A_v$ .

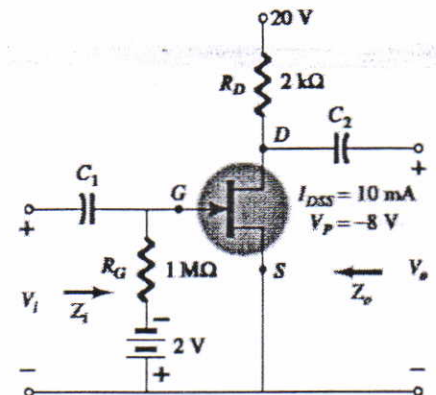


Figure q1-b

20 Marks

**Q2.**

For the cascode amplifier of figure q2, determine the voltage gain

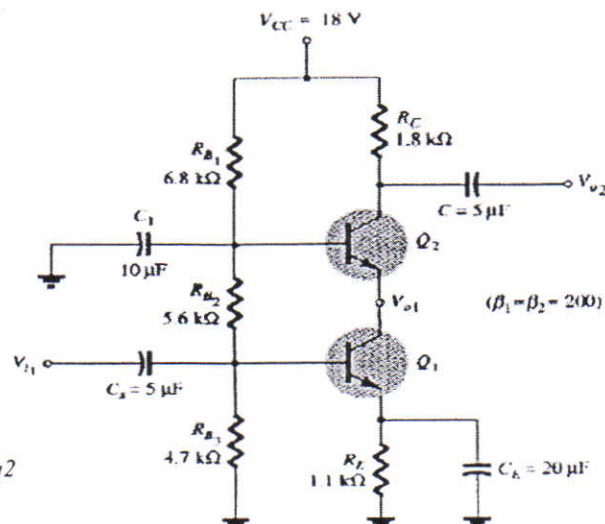


Figure q2

15 M

5. Which type of ADC quantizes the analog signal into a stream of bits whose amount corresponds to the signal level?

(a) Successive-approximation ADC.

(b) Dual-slope ADC.

(c) Dual-slope ADC.

(d) None of the above.

6. In a flash ADC, the output of each comparator is connected to an input of a:

(a) Decoder.

(b) Buffer.

(c) Multiplexer.

(d) Priority encoder.

7. The percentage resolution of a 10-bit ADC is nearly:

(a) 1%

(b) 0.01%

(c) 0.1%

(d) 10%

8. Sample-and-hold circuits in analog-to digital converters (ADCs) are designed to:

(a) sample and hold the output of the binary counter during the conversion process

(b) stabilize the comparator's threshold voltage during the conversion process

(c) stabilize the input analog signal during the conversion process

(d) sample and hold the D/A converter staircase waveform during the conversion process

(12 Marks)

b- Determine the binary code output of the 3-bit flash ADC in Figure 1 for the input signal in Figure 2 and the encoder enable pulses shown. For this example,  $V_{REF} = +8V$ . (8 Marks)

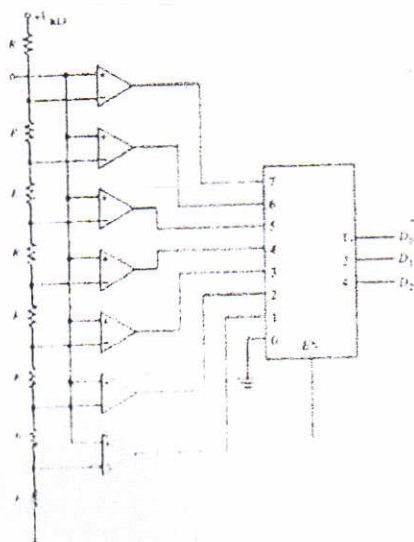


Figure 2

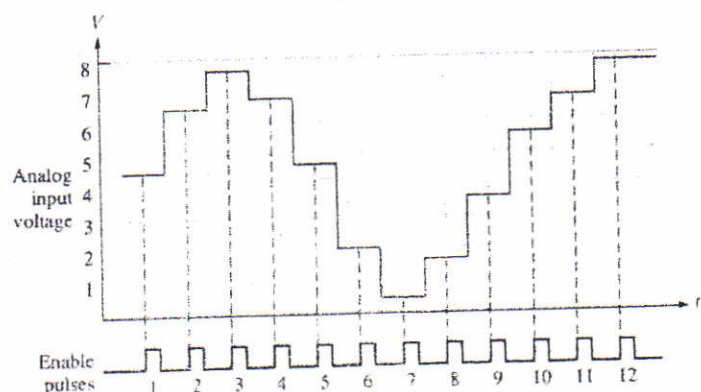


Figure 1

Q 4-a Answer only six:

1- C in GAT refers to -----



(d) 00101101

6. The purpose of the clock input to a flip-flop is to

(a) clear the device

(b) set the device

(c) always cause the output to change states

(d) cause the output to assume a state dependent on the controlling CLK or  $\Phi$  input

For an edge-triggered J flip-flop:

(a) a change in the state of the flip-flop can occur only at a clock pulse edge

(b) the state that the flip-flop goes to depends on the D input

(c) the output follows the input at each clock pulse

(d) all of these answers

8. A J-K flip-flop with  $J = 1$  and  $K = 1$  has a 10 kHz clock input. The Q output is

(a) constantly HIGH

(b) constantly LOW

(c) a 10 kHz square wave

(d) a 5 kHz square wave

b- A sequential circuit with two D flip-flops A and B, two inputs x and y, and one output z is specified by the following next-state and output equations:

$$A(t+1) = x'y + xB$$

$$B(t+1) = x'A + xB$$

$$z = A$$

(i) Draw the logic diagram of the circuit.

(ii) List the state table for the sequential circuit.

(iii) Draw the corresponding state diagram.

(8 Marks)

**Q 3- a- Answer only six:**

1. Aliasing results in

(a) oversampling

(b) undersampling

(c) guard-band formation

(d) perfect sampling

2. Generally, an analog signal can be reconstructed more accurately with

(a) more quantization levels

(b) fewer quantization levels

(c) a lower sampling frequency

(d) none of the above

3. A digital voltmeter uses a

(a) flash ADC

(b) successive approximation ADC

(c) sigma-delta ADC

(d) dual-slope ADC

4. Which is not an A/D conversion errors?

(a) Incorrect code

(b) Differential nonlinearity

(c) Missing code

(d) Offset

By using the simplified notation of PLDs, show the GAL connection of 4:1 multiplexer?  
The Boolean expression for the multiplexer should first be stated then implemented.

Q 5- a- Answer only six:

1. Each cell in memory array is connected to one of row lines, these row lines are termed as
  - (a) word lines
  - (b) digit lines
  - (c) bit lines
  - (d) selected lines
2. 64M bit chip in which all bits are individually addressable is said to be organized as
  - (a) 32M words x 1bit
  - (b) 64M words x 1bit
  - (c) 64M word x 2 bit
  - (d) 16M word x16 bit
3. Cell matrix with  $2^m$  rows and  $2^n$  columns will have total storage capacity of
  - (a)  $2^{mn}$
  - (b)  $2^{m/n}$
  - (c)  $2^{n/m}$
  - (d)  $2^{m+n}$
4. Which components play a significant role in the formation of a DRAM?
  - (a) Two MOSFETs
  - (b) Two capacitors
  - (c) One MOSFET and one capacitor
  - (d) One MOSFET and two capacitors
5. With the availability of 16 x 4 memory size, how many ICs (memory chips) will be required for the expansion of its word size in order to obtain 16 x 8 memory?
  - (a) 2
  - (b) 4
  - (c) 8
  - (d) 16
6. Which among the following techniques is used by EPROM for erasing purpose?
  - (a) Force Convection
  - (b) Ultraviolet Radiation
  - (c) Photo-conduction
  - (d) None of the above
7. To obtain 16-bit data bus width, the two 4K X 8 chips of RAM are arranged in
  - (a) parallel
  - (b) serial
  - (c) both serial and parallel
  - (d) neither serial nor parallel
8. A nonvolatile type of memory that can be programmed and erased in sectors, rather than one byte at a time is:
  - (a) flash memory
  - (b) EPROM



- (a) General
  - (b) global
  - ☒ (c) generic
  - (d) none of the previous
- 2- PAL can be programmed for -----
- ☒ (a) One time
  - (b) 10 times
  - (c) more than 10000 time
  - (d) none of the previous
- 3- Programming fuses in GAL are -----
- ☒ (a) Semiconductor junctions
  - (b) dioxide metals
  - (c) transistors
  - (d) none of the previous
- 4- The term LAB stands for -----
- (a) Logic assembly block
  - (b) logic and block
  - ☒ (c) logic array block
  - (d) none of the previous
- 5- The basic structure of pal and gal is a ----- and fixed OR array.
- (a) Programmable AND array
  - ☒ (b) combinational logic
  - (c) sequential logic
  - (d) none of the previous
- 6- The GAL is essentially a PAL that can be -----
- ☒ (a) Reprogramed
  - (b) connected
  - (c) converted
  - ☒ (d) none of the previous
- 7- F in FPGA refers to -----
- (a) field
  - (b) fast
  - (c) Fundamental
  - (d) none of the previous
- 8- PLDs are -----
- (a) Types of transistors
  - ☒ (b) integrated circuits
  - (c) a technology
  - (d) none of the previous

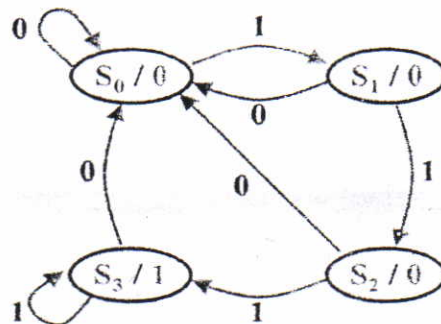
(12 Marks)

8. In VHDL, which object/s is/are used to connect entities together for the model formation?

- (a) Constant
- (b) Variable
- (c) Signal
- (d) All of the above

b- Write a VHDL code to implement the state machine shown below.

(8 Marks)



30/5  
S-en Haseem

Chairman of Central Committee

Rohit

Chairman of Engineering Committee



(c) EEPROM

(d) PROM

(12 Marks)

Design a 64 Kbit ROM module of (4K X 16 bit) organization by using (4K X 8 bit) ROM chips.

(8 Marks)

Q. 6. a. Answer only six

VHSIC stands for

- (a) Very High Speed Integrated Circuits
  - (b) Very Higher Speed Integration Circuits
  - (c) Variable High Speed Integrated Circuits
  - (d) Variable Higher Speed Integration Circuits
2. VHDL has been used for \_\_\_\_\_
- (a) Documentation
  - (b) Verification
  - (c) Synthesis of large digital design
  - (d) All of the Mentioned
3. Which among the following wait statement execution causes the enclosing process to suspend and then wait for an event to occur on the signals?
- (a) Wait until Clk = '1'
  - (b) Wait on x,y,z
  - (c) Wait on clock until answer > 80
  - (d) Wait for 12 ns
4. In composite data type of VHDL, the record type comprises the elements of \_\_\_\_\_ data types.
- (a) Same
  - (b) Different
  - (c) Both a and b
  - (d) None of the above
5. Which among the following is pre-defined in the standard package as one-dimensional array type comprising each element of BIT type?
- (a) Bit type
  - (b) Bit vector type
  - (c) Boolean type
  - (d) All of the above
6. In VHDL, which class of scalar data type represents the values necessary for a specific operation?
- (a) Integer types
  - (b) Real types
  - (c) Physical types
  - (d) Enumerated types
7. Which data type in VHDL is non synthesizable & allows the designer to model the objects of dynamic nature?
- (a)
  - (b)
  - (c)
  - (d) File

Scalar  
Access  
Composite

**Q3:** A series D.C motor , 200 rpm with applied voltage 100 V ,takes an armature current of 20 A has armature resistance is  $0.15 \Omega$  and there are four field coils, each any one  $0.05 \Omega$  in series with armature resistance .Assume flux to proportional to field current. Find the new speed :- (15 Marks)

- a- If load torque be doubled and coils field arranged in series -parallel (two in series, two sets in parallels)
- b- If connected a  $10 \Omega$  resistance in parallel with the armature circuit and run with same torque.

**Q4:** A 4- pole, lap wound shunt D.C motor runs at 800 rpm takes 35 A. The shunt field resistance is  $110 \Omega$  and overall efficiency is 80% .If the mechanical power developed in armature 6824.4 W. The friction and iron losses 664.4 W .Find

- a- Electrical efficiency.
- b- The resistance required to connected in series ( $R_{add}$ ) with armature circuit to reduce the speed to 75% when the armature torque is proportional to the cube of speed Assume the flux is constant.
- c- The resistance sections of starter connected to this motor by using same armature resistance and voltage supply from above before adding ( $R_{add}$ ) if maximum armature current is 40 A and the resistance of final section is  $0.219 \Omega$

(15 Marks)

**GOOD LUCK**

السيد رئيس القسم المحترم

Lecturer:- Faisal Al-Taie





**Second Course /Final Examination  
First attempt**

Class: 2<sup>nd</sup> stage  
Time: 180 min.  
Date: 9 / June / 2019  
Full Mark: 70  
Subject: Electrical Machine I  
Lecturer: Faisal Al-Taie

**Note: Answer All Questions**

**Q1: A /** Drive and write the condition for maximum power of dc motor, and What the limitation of this condition in practice? **(10 Marks)**

**Q1: B/** Indicate **Five** of the following statements whether is true or false and correct the false statement. **(10 Marks)**

- 1- The relation between  $T_a$  and  $I_a$  of dc shunt motor is known as the mechanical characteristics.
- 2- When a series dc motor is operating without load, the armature will not run.
- 3- The difference between a three-point starter and a four point starter is the manner in which over-load release coil connected.
- 4- Swinburne test cannot be used for series motor.
- 5- The overheating of dc motor may be due to ground, open and short circuit faults.
- 6- When the iron loss transformer at full load is 200W, the iron loss at half load will be 100W.
- 7- The  $T_{sh}$  in dc motor is less than  $T_a$  because of total losses in the motor.

**Q2: A/** The all-day efficiency of 100 kVA transformer is 98% and has iron losses 270 W when the transformer is loaded in table shown. **(12 Marks)**

Calculate: -

- a- Efficiency at half -full load at p.f 0.6 lagging.
- b- The maximum efficiency at p.f 0.85 lagging

Load in kW	Time period in (hours)	Power factor
51	10	0.85 lagging
64	8	0.8 lagging
35	5	0.7 lagging
No-load	1	-

**Q2: B /Choose One of the following:-**

**(8 Marks)**

**B<sub>1</sub>.** In Hopkinson's test on two similar dc shunt machines give the following full load data, input power to motor 25.63 kW, the output of generator is 20.35 kW, Line voltage 110 V and field currents of motor and generator are 3 A, 3.5 A respectively. The armature resistance 0.035  $\Omega$  for each machine and voltage drop equal 1V for each brush .Find the efficiency of generator .Assume two machines are equal iron and friction losses.

**B<sub>2</sub>** - 40 kVA, 4000/ 200 transformer has  $R_1 = 10\Omega$ ,  $R_2 = 0.02\Omega$ ,  $X_1 = 12\Omega$ ,  $X_2 = 0.0325\Omega$ . Prove the total copper losses when the transformer referred to primary side **equal** to the total copper losses of transformer when referred to secondary side and Calculate the percentage voltage regulation of transformer when supplying full load current at a p.f of 0.8 lagging and secondary terminal voltage a' full load primary supply voltage is 4000V.

Q4) The state model of a system is 
$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t)$$

$$y = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$

[10 Marks]

- Check the controllability and observability.
- State transition matrix.
- Transfer matrix.
- Draw the block diagram of transfer function.

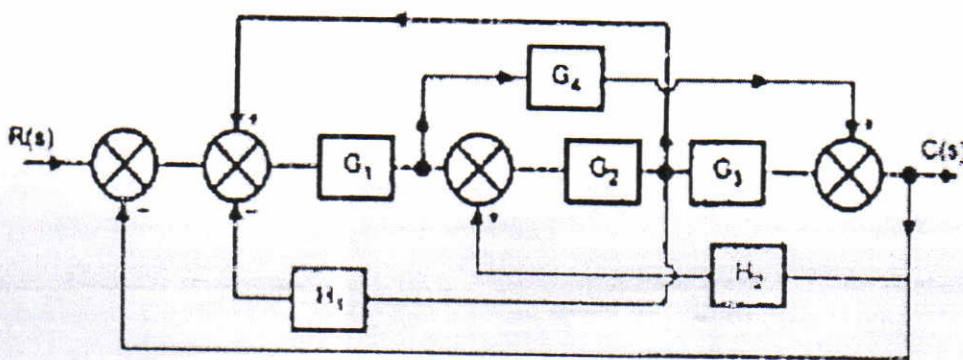


Fig.(1)

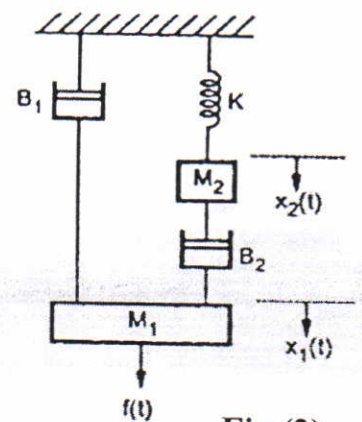


Fig.(2)

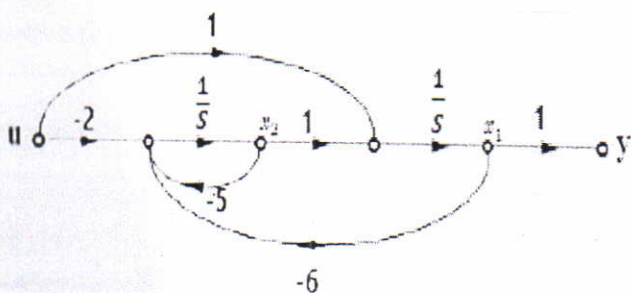


Fig.(3)

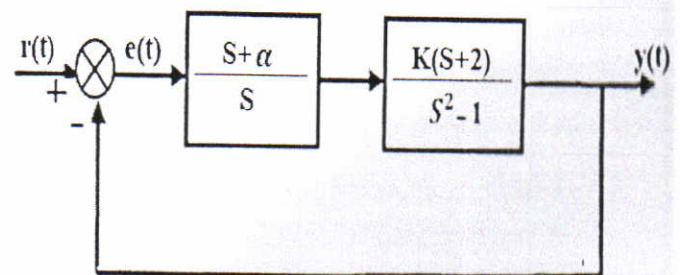


Fig.(4)

Good Luck

Head of Department

Lecturer





**Note:- Answer All Questions**

**Q1A)** For the control system shown in the below **Fig.(1)**, Find the transfer function by using Block diagram reduction rules **or** Signal Flow Graph (SFG). **[10 Marks]**

**B)** Draw the equivalent mechanical system of the given system in **Fig.(2)**. Hence write the set of equilibrium equations for it and obtain electrical analogous circuits using,

**i) F-V analogy**

**ii) F-I analogy**

**[7 Marks]**

**Q2) Answer any six of the following and support your answer with solution steps. [18 Marks]**

- 1- Show the **ratio** of feedback signal  $B(s)$  to the reference  $R(s)$  whose  $G(s)$  is forward path with negative feedback  $H(s)$ .
- 2- A unity feedback system with open-loop transfer function  $G(s) = 4/[s(s+p)]$  is critically damped. What is the value of the parameter  $p$ .
- 3- A first-order system with process gain 4 and time constant 3 (arbitrary time units) is subjected to an impulse input of strength 6 at  $t = 0$ . **What is the value of the output response at time  $t = 0$ ?**
- 4- Find The phase (in degrees) of a system having the open loop transfer function

$$G(s)H(s) = \frac{2\sqrt{3}}{s(s+1)}$$

- 5- Draw an illustrative sketch of gain and phase graphs at Bode plot whose  $w_{gc} > w_{pc}$ , and discuss the stability.

- 6- The open loop transfer function of a control system is  $G(s) = \frac{(1+2s)(1+4s)}{s^2(s^2+2s+8)}$ ,

**Find the position, velocity and acceleration error constants.**

- 7- A unity feedback system has open-loop transfer function  $G(s) = \frac{1}{s(s+1)(2s+1)}$ . Determine the **gain and phase crossover frequencies** mathematically.

- 8- Consider the system shown in **Fig (3)**, Write the **Controllability and Observability matrix**.

- 9- For the certain unity feedback system  $G(s) = \frac{K}{s(s+1)(2s+1)(3s+1)}$ , **What is the Nyquist plot.**

**Q3A):-** For the unity feedback system which has  $G(s) = \frac{K}{s(s+3)(s^2+2s+2)}$ ,

**Draw the root locus.**

**[10 Marks]**

**B)** The block diagram of a control system is shown in **Fig(4)**. Find the region of  $K$  and  $\alpha$  that lead the system to be stable. **[5 Mark]**

**Q3: A-** The constant of 3- $\phi$  transmission medium line are:  $A = 0.861 \angle 1^\circ$ ,  $B = 156.58 \angle 78.35^\circ$  and power receiving 340.088 MW, 275 kV with power factor of 0.85 lagging at the receiving end.

Using T method for Calculate

(16 Marks)

- a- Voltage regulation.
- b- Power loss
- c- The parameters of line (Z, Y).
- d- Torque angle.

**Note:** Supported your answer with phasor diagram and electrical circuit.

**Q3: B: Choose one of the following**

(9 Marks)

- 1- Prove the value reduction of maximum electric stress of grading cable by used two metallic inter sheath with best location is  $\frac{1}{3}(1+k+k^2)$  when comparing it with un grading cable if the voltage cross the cable is constant and same value (distance  $r, R$ ).
- 2- Drive the expression for the power loss in the uniformly loaded distributor fed at one end.


**Q4: Choose Two of the following**

(10 Marks)

- 1- What is the effect of load p.f on transmission line efficiency?
- 2- How does ac distribution calculation differ from those dc distributions?
- 3- What is corona? What are the factors affecting the corona? How can avoid it.
- 4- Define distributor, write types dc distributor and disadvantage singly fed distributor.

*Good luck*

  
Head of department

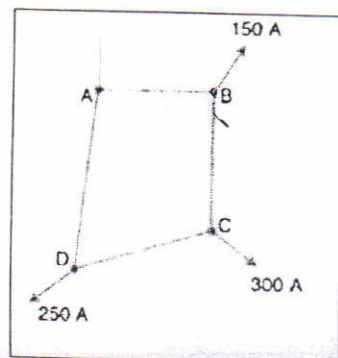
  
Lecturer: Faisal Al-Taie





**Note: Answer All Questions**

**Q1:** 2- wire dc distributor ABCDA in the form of ring system main is fed from point A has length 1000 m and it is loaded as shown in fig bellow. The resistances of various sections (go and return) are  $R_{AB} = 0.025 \Omega$ ,  $R_{BC} = 0.04 \Omega$ ,  $R_{CD} = 0.02 \Omega$ ,  $R_{DA} = 0.015 \Omega$ . If interconnector joined between point A and point C



Find:

- 1- The currents in sections after interconnector joined if the current of interconnector is 200 A.
- 2- Compare between minimum potential on ring distributor before and after interconnector joined if voltage fed at point A is 250 V and write conclusion. (15 Marks)

**Q2: A //** A two wire dc distributor 800 m long loaded with 0.75 A/m. The resistance of distributor ((go and return) is  $0.1 \Omega$ . If the distributor is fed from both ends of 220 V. Find :- (5 Marks)

- Minimum voltage and where it occurs?
- Total power loss in the distributor.

**Q2: B //** A Single core cable with 50 Hz, has radius of conductor of 0.5 cm and the insulator consists of two layers each of its relative permittivity of 6, 4 respectively. The thickness of 1<sup>st</sup> layers is 2.5 cm and second layer is 3 cm. If metallic inter sheath is placed between the two layers of insulators and connected to supply transformer through a switch. When the switch is open was total charging current 4.07 mA and

- a- The total capacity of single core cable.
- b- The voltage of each layer.
- c- The maximum electric stress of cable when the switch is closed and the voltage of the transformer is 38.33 kV.
- d- New thickness of the insulator in order to get same maximum electric stress which obtained in Point c when using one layer for same cable. (15 Marks)

Q3) For the circuit shown in Fig.(2), determine the currents  $I_A$ ,  $I_B$ , and  $I_C$ , using the mesh current analysis method. [10 Mark]

Q4A) For the circuit shown in Fig.(3), determine the currents  $V_1$ , and  $V_2$ , using Nodal analysis method. [10 Mark]

B) Show the RMS Voltage value of a sinusoidal waveform is 0.707 of peak value. [5 Mark]

Q5A) For the system in Fig.(4).

[10 Mark]

a. Find the total number of watts, volt-amperes reactive, and volt-amperes, and  $F_p$ .

b. Find the current  $I_s$ .

c. Draw the power triangle.

B) What is advantages of good power factor? and if the power factor is low, how it can be improved? [5 Mark]

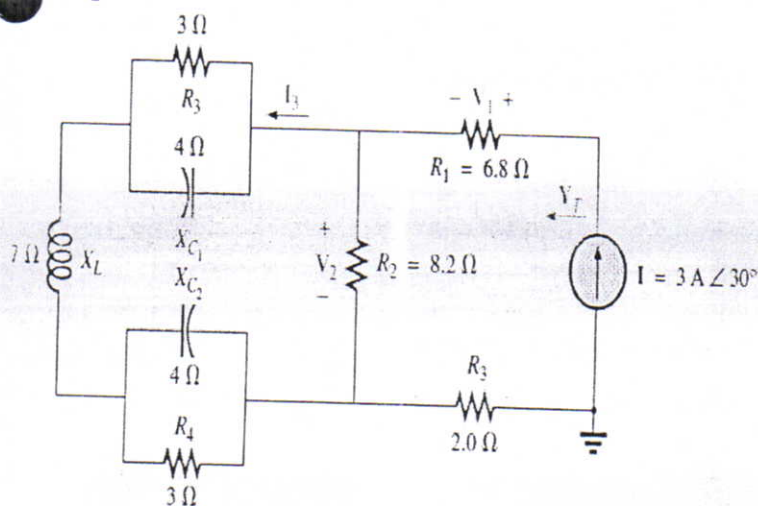


Fig.1

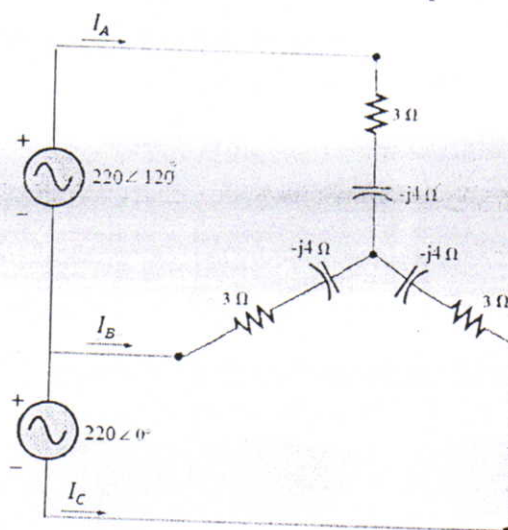


Fig.(2)

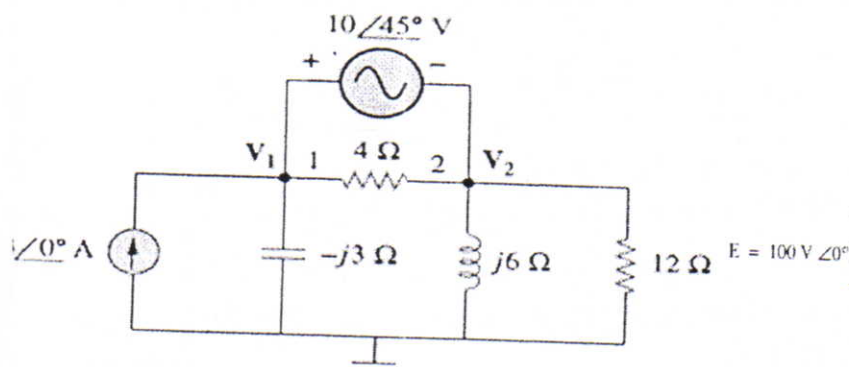


Fig.3

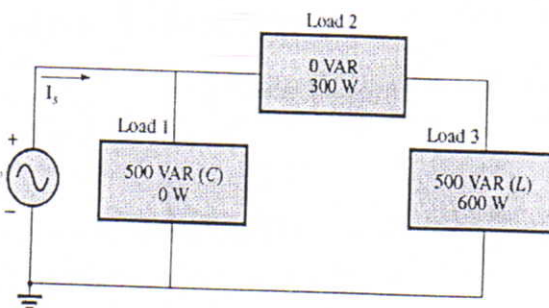


Fig.4

Head of Department

Good Luck

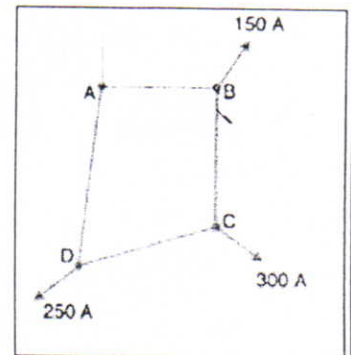
Lecturer





**Note: Answer All Questions**

**Q1:** 2- wire dc distributor ABCDA in the form of ring system main is fed from point A has length 1000 m and it is loaded as shown in fig bellow. The resistances of various sections (go and return) are  $R_{AB} = 0.025 \Omega$ ,  $R_{BC} = 0.04 \Omega$ ,  $R_{CD} = 0.02 \Omega$ ,  $R_{DA} = 0.015 \Omega$ . If interconnector joined between point A and point C Find:



- 1- The currents in sections after interconnector joined if the current of interconnector is 200 A.
- 2- Compare between minimum potential on ring distributor before and after interconnector joined if voltage fed at point A is 250 V and write conclusion. (15 Marks)

**Q2: A** // A two wire dc distributor 800 m long loaded with 0.75A/m. The resistance of distributor ((go and return)) is  $0.1 \Omega$ . If the distributor is fed from both ends of 220 V. Find :- (5 Marks)

- 1- Minimum voltage and where it occurs?
- 2- Total power loss in the distributor.

**Q2: B** // A Single core cable with 50 Hz, has radius of conductor of 0.5 cm and the insulator consists of two layers each of its relative permittivity of 6, 4 respectively. The thickness of 1<sup>st</sup> layers is 2.5 cm and second layer is 3cm .If metallic inter sheath is placed between the two layers of insulators and connected to supply transformer through a switch. When the switch is open was total charging current 4.07 mA Find

- a- The total capacity of single core cable.
- b- The voltage of each layer.
- c- The maximum electric stress of cable when the switch is closed and the voltage of the transformer is 38.33 kV.
- d- New thickness of the insulator in order to get same maximum electric stress which obtained in Point c when using one layer for same cable. (15 Marks)





Answer Four Questions including Q1

(25 marks)

Q1:

Your computer is connected to an embedded microcontroller via SPI, you are trying to perform an attack by first guessing their processor clock, the baud rate was set to 8 MHz, and the content of SPIxBR is known to be:

	SPPR2	SPPR1	SPPR0		SPR2	SPR1	SPR0	
	0	0	0	1	0	0	1	0

Use your knowledge and the data available to perform the first goal mentioned above (ignore further steps of the attack for now).

(25 marks)

Q2:

In an embedded system, PWM module of channel 0 requires its clock to be 3MHz in order to operate in the desired manner, the system bus clock is 768MHz, what will be the source of clock for this channel, list the related registers and their contents in order to achieve this speed.

(25 marks)

Q3:

Two computers, Comp1 and Comp2 are communicating via EIA232 standard, show the sequence of events during data transmission over a dedicated link.

(25 marks)

Q4:

The EIA232 standard is being used to transmit data, the character (0x4A) was transmitted using asynchronous data communication, and the format used is 1-start bit, 4-data bits, 1-stop bit and even parity bit. Show the transmitted data packets.

(25 marks)

Q5:

Answer the following briefly:-

- Why do ports AD0 and AD1 (analogue to digital) have NO DDR registers.
- State the electrical considerations when interfacing an I/O device with a microprocessor in terms of voltage level compatibility.
- State the electrical considerations when interfacing an I/O device with a microprocessor in terms of current drive capability.
- Why serial communication is preferable to use over parallel communication in digital computer (e.g. microcontroller) based systems.
- What are the types of data transmission errors?

Best of Luck....

Dr. Eng. Muayed S Al-Huseiny



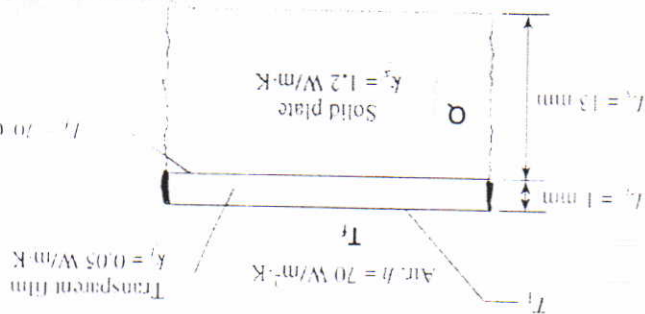
120 Marks

Subject: Engineering Mechanics  
Class: First grade  
Time: Three hours  
Date: 12/06/2019

Q1] Answer only FOUR of the following.

- 1- Define: Thermodynamics, boundary, state, efficiency, and forced convection.
- 2- What are the modes of heat transfer? Write the equation of each mode.
- 3- What is the difference between intensive and extensive properties? Give examples for each.
- 4- What is the difference between heat transfer and thermodynamics?
- 5- Consider a 2 m deep swimming pool. Find the pressure difference between the top and bottom of the pool. The water density is  $1000 \text{ kg/m}^3$ .

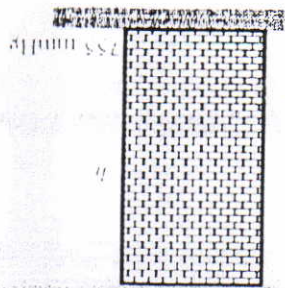
(Q2] In the figure shown below, find  $T_1$  and  $T_2$ .  
The heat transfer direction ( $Q$ ) is from the top side to the bottom one as indicated.



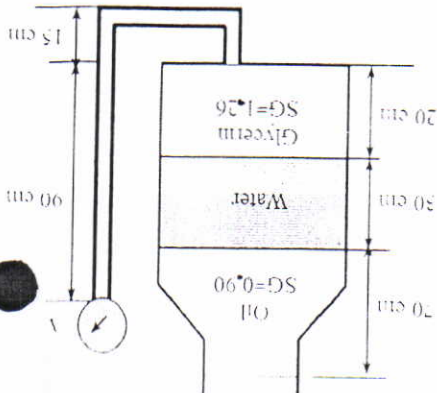
120 Marks

[30 Marks]

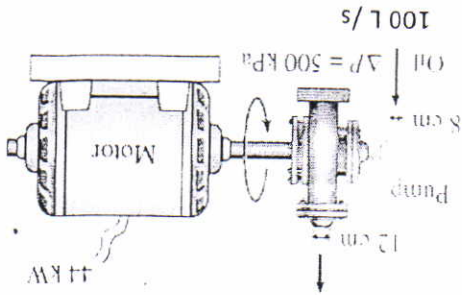
- a) The basic barometer can be used to measure the height of a building. If the barometer readings at the top and at the bottom of a building are 730 and 755 mm Hg, respectively, determine the height of the building (h). Take the densities of air and mercury to be  $1.18 \text{ kg/m}^3$  and  $13600 \text{ kg/m}^3$ , respectively.



- b) A multi-fluid container is connected to a U-tube as shown below. For the given specific gravities and fluid column heights, find the gauge pressure at A (Pa). Also, find the height of a mercury column that would create the same pressure at A.



- c) A motor of an oil pump is drawing 44 kW of electric power while pumping oil with  $\rho = 860 \text{ kg/m}^3$  at a rate of 100 L/s. The inlet and outlet diameters of the pipe are 8 cm and 12 cm, respectively. If the pressure of the oil in the pump is measured to be 500 kPa and the motor efficiency is 90 percent, determine the mechanical efficiency of the pump and the overall efficiency.



Good Luck

Examiner: Dr. Mohamed A. Al-Waili

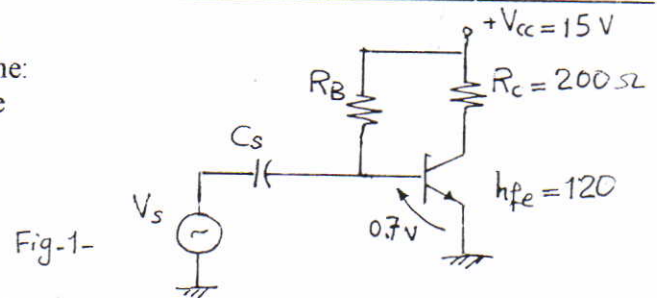


Final Second Term Exam 2018 – 2019

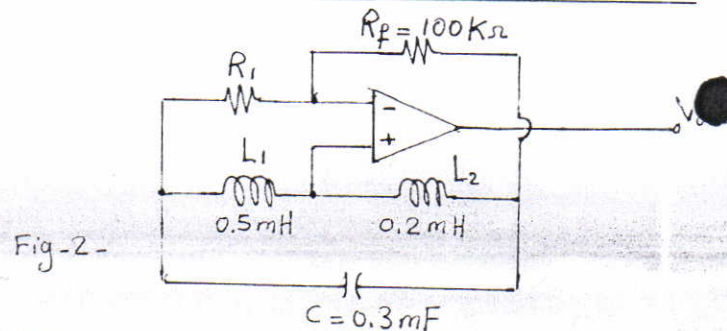
Answer 4 questions only. Each have (17.5 Mark)

Q1: In the power amplifier of fig.1 shown. Determine:

- The value of ( $R_B$ ) that locates the Q-point in the center of the load line.
- The maximum output power.

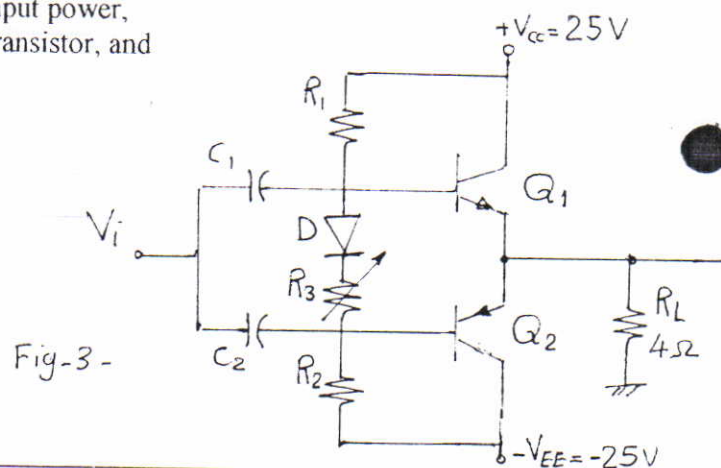


Q2: for the hartely-oscillator of fig. 2  
Determine ( $f_o$ ) and the value of ( $R_1$ ).



Q3: show the effect of finite transistor ( $\beta$ ) on operation of the current mirror source, and how can reduce the dependence of ( $I_o$ ) on ( $\beta$ ), draw the circuit with formulas.

Q4: for the circuit in fig.3 shown calculate the input power, output power, and power handled by each transistor, and circuit efficiency for an input of 12 V<sub>r.m.s</sub>.

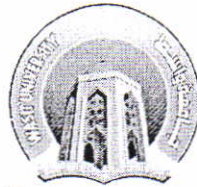


Q5: Draw the evolution of TTL from DTL, then state the advantages and disadvantages of DTL gate in integrated circuit.

*[Handwritten signature]*

*[Handwritten notes]*  
2014/2015  
2015/2016





Q1/A) The circumference of an ellipse can be approximated by:  $c = \pi \left[ 3(a+b) - \sqrt{(3a+b)(a+3b)} \right]$

Calculate the circumference of an ellipse with  $a = 16$  in. and  $b = 11$  in.

(8 marks)

B) Create the following matrix  $E$  then answer one of the following:

(7 marks)

- 1- Create a  $2 \times 3$  matrix  $F$  from the second and third rows, and the third through the fifth columns of matrix  $E$ .
- 2- Create a  $4 \times 4$  matrix  $G$  from all rows and the third through sixth columns of matrix  $E$ .

$$E = \begin{bmatrix} 0 & 5 & 5 & 5 & 5 & 5 \\ 0.1 & 0.3 & 0.5 & 0.7 & 0.9 & 1.1 \\ 12 & 9 & 6 & 3 & 0 & -3 \\ 6 & 7 & 8 & 9 & 10 & 11 \end{bmatrix}$$

Q2/A) Create a vector (name it  $vtA$ ) that has 10 elements of which the first is 8, the increment is 7, and the last element is 71. Then, assign elements of  $vtA$  to a new vector (call it  $vtB$ ) such that  $vtB$  has 7 elements. The first 4 elements are the first 4 elements of the vector  $vtA$ , and the last 3 are the last 3 elements of the vector  $vtA$ . Do not type the elements of  $vtA$  vector explicitly.

(8 marks)

B) The magic square is an arrangement of numbers in a square grid in such a way that the sum of the numbers in each row, and in each column, and in each diagonal is the same. MATLAB has a built-in function `magic(n)` that returns an  $n \times n$  magic square. In a script file create a  $(6 \times 6)$  magic square, and then test the properties of the resulting matrix by finding the sum of the elements in each row, in each column and in both diagonals. In each case, use MATLAB's built-in function `sum`. (Other functions that can be useful are `diag` and `fliplr`.)

(7 mark)

Q3/A) Plot the function  $f(x) = \sin^2(x)\cos(2x)$  and its derivative, both on the same plot, for  $0 \leq x \leq 2\pi$ . Plot the function with a solid line, and the derivative with a dashed line. Add a legend and label the axes.

(10 marks)

B) Write a MATLAB program in a script file that calculate the average, standard deviation, and median of a list of grades as well as the number of grades on the list. The program asks the user (input command) to enter the grades as elements of a vector. The program then calculates the required quantities using MATLAB's built-in functions `length`, `mean`, `std`, and `median`. The results are displayed in the Command Window in the following format:

(10 marks)

- "There are XX grades." where XX is the numerical value.
- "The average grade is XX." where XX is the numerical value.
- "The standard deviation is XX." where XX is the numerical value.
- "The median grade is XX." where XX is the numerical value.

D- Invent, create, improve and fix electronic devices, tools and equipment

2. Which inventions were created by electrical engineering?

A- The television

B – The cell phone

C- The vacuum cleaner

D- All these answers are correct

3. Why is electrical engineering important?

A - A variety of electrically engineered devices make things easier to do, keep you healthy, keep you safe and help you to have fun

B - Electrical engineering requires teamwork.

C- Electrical engineers create furniture for homes

D- Electrical engineers give people x rays in hospitals.

4. What is the meaning of the term bachelor's degree?

5. What engineering materials electrical engineers should know a lot about?

Q2) Write a short essay (100 – 150) words or 1 page long about one of the following topics:

What would you do if you were the president of Wasit university about:

- Improving the quality of education in the university.
- Providing good studying environments for student (well-equipped classrooms, open internet service, bringing good professors to the colleges).
- Building additional building in the university (gym, library, laboratories)

What would you do if you were the governor of Wasit governate about:

- Improving infrastructures (roads, bridges, airport, electricity, water and sewer networks)
- Improving the business environment (projects that create jobs, encouraging investors)
- Enforcing justice and security in the community.

Q3) Write a short essay (100 – 150) words or 1 page long about one of the following topics:

- A hero or best model in your life (the person who affected you the most).

د. عبد الحليم



Wasit University

3<sup>rd</sup> year students (junior)

College of Engineering  
Electrical Engineering Depart.



English language, Final exam  
Date: Jun. 2019, Exam time: 3:00 hrs

---

Q1) Read the following essay and answer the questions at the end

What Is Electrical Engineering?

Look around your house or outdoors. Do you notice any devices that are plugged in or use batteries to get **electricity** to work? All of these devices have been created and designed by electrical engineers.

**Electrical engineering** is the name for the field in which people invent, create, improve and fix electronic devices, tools and equipment. Electrical engineers use lots of math, science and research to develop all kinds of small and large devices and the electrical circuits that help them run.

Why is Electrical Engineering Important?

You use a variety of electrical devices that help you have fun, make things easier to do, keep you safe and keep you healthy. For instance, have you ever thought about how long it would take to walk to your friends' house to have a conversation? Electrical engineers made this quicker and easier with the creation of the telephone, and later on, the cell phone. We depend on phones to talk to one another and call for help in emergencies.

Have you ever noticed electricity poles with wires outdoors? Electrical engineers figured out how to get electricity to our homes to supply us with the electricity we need to have lights, cook, and even stay warm or cool. Electrical engineers also invented wireless networks that we use every day.

You probably enjoy watching your favorite movie and shows on television. You can thank electrical engineering for that too! Do you enjoy playing video games? Well, electrical engineers created the electrical parts of video game consoles. Also, electrical engineers created lots of different kinds of medical equipment that helps doctors do their jobs, such as x-ray machines.

1. What do electrical engineers do?

A - Invent, create and fix x-ray machines

B - Design video games and cell phones

C- Invent, create, improve and fix electronic devices, tools and equipment

فأنت  
- Your best friend.

Q4) Answer the following questions

- 1-Electric current is measured using what device?
2. In electricity, voltage is measured in ..... ..
- 3- True or false? Batteries convert chemical to electrical energy
- 4- In terms of electricity, what does DC stand for?
- 5-The wire inside an electric bulb is known as the what?
- 6-Conductors have a high or low resistance?
- 7-True or false? The concept of electric fields was first introduced by Albert Einstein.
- 8-Electric resistance is typically measured in what units?
- 9- n terms of electricity, what does AC stand for?
- 10-Electric power is typically measured in what units?
- 11-True or false? You can extend battery life by storing batteries at a low temperature

Q5) Correlate the number of the word in the left column with the letter of its corresponding synonym in the right column

- |                |             |            |            |
|----------------|-------------|------------|------------|
| 1- Occur       | a- mix      | 10- Blend  | j-happen   |
| 2- Opportunity | b- honest   | 11-Sincere | k-circular |
| 3- Old         | c- rough    | 12- Slim   | l-wealthy  |
| 4- Quiet       | d- enquire  |            |            |
| 5- Rest        | e- peaceful |            |            |
| 6- Rich        | f- thin     |            |            |
| 7- Coarse      | g- ancient  |            |            |
| 8- Round       | h-chance    |            |            |
| 9- Ask         | i- relax    |            |            |



المادة:- حقوق الانسان  
المرحلة:- الاولى  
الوقت:- ثلاث ساعات  
التاريخ:-

بسم الله الرحمن الرحيم  
جمهورية العراق

وزارة التعليم العالي والبحث العلمي  
رئاسة جامعة واسط  
عمادة كلية الهندسة  
القسم:- الكهرباء



اسئلة الامتحان النهائي/الكورس الثاني- دور الاول  
للسنة الدراسية ٢٠١٨-٢٠١٩

بسم الله الرحمن الرحيم

س١:- قارن مابين دستور جمهورية العراق والدستور الفرنسي فيما يخص حقوق الانسان؟

(١٤ درجة)

(١٤ درجة)

س٢:- تكلم عن العهدان الدوليان فيما يخص حقوق الانسان ؟

س٣:- عدد اهم الحقوق الاقتصادية التي تطرق اليها الاعلان العالمي لحقوق الانسان  
١٩٤٨ ؟  
(١٤ درجة)

س٤:- اكتب بحثاً او مقالة قد تناولتها في اثناء دراستك متناولا فيها موضوع يخص  
حقوق الانسان مراعي فيه المصادر التي قد تناولتها اثناء كتابة الموضوع وعرض مبسط  
للمادة فضلا عن استنتاجاتك في دراسة الموضوع؟  
(١٤ درجة)

س٥:- اجب عن احد الفرعين

أ- عدد اهم الحقوق السياسية التي تطرق اليها الاعلان العالمي لحقوق الانسان؟  
ب- ناقش النص الاتي ((يولد الناس احراراً متساوين في الكرامة والحقوق، وقد وهبوا  
عقلاً وضميراً وعليهم ان يعاملوا بعضهم بعضاً بروح الاخاء))

(١٤ درجة)

مع تمنياتنا لكم بالنجاح والتوفيق  
استاذ المادة  
م. د. سوسن فاضل كاظم