جمهورية العراق

وزارة التعليم العالي و البحث العلمي

جامعة الفرات الأوسط التقنية

الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات الاتصالات

المرحلة الثالثة

أسئلة الفصل الأول للعام الدراسي

٢٠١٦-٢٠١٧

شعبة ضمان الجودة و الأداء الجامعي

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية / نجف

القسم : هندسة تقنيات الاتصالات
المرحلة :الثالثة
المادة: تحليلات هندسية وعددية
زمن الامتحان: ساعتان
التاريخ: 2017/01/ 22

امتحان الفصل الأول- العام 2017/2016

Part – A
Laplace Transformations

Q1:- Answer any two only:-

1) $L[y'''(t)] = s^3L[f(t)] - s^2f(t) - s f'(0) - f''(0)$ ***(10 marks)***

2) $\frac{\sin(5\,t\,e^{3t})}{t}$ ***(10 marks)***

3) If $L[g(t)]=G(s)$, $L[f(t)]=F(s)$, *and* $f(c\,t)=g(t)$, *prove that* $F(\frac{S}{c})=c\,G(S)$, *where C is a positive constant.* ***(10 marks)***

Q2:- (A)Solve the system:- ***(10 marks)***

$y'''+2y''+y'+2y=2 \qquad y(0)=3,\ y'(0)=-2,\ y''(0)=3$

(B) Find the Laplace transform to : ***(10 marks)***

$$f(x)=\begin{cases} 0 & t<1 \\ t^2-2t+1 & t\geq 1 \end{cases}$$

Q3:- find the inverse Laplace transform to two only:

1) $1/s^2\,(1-e^{-s})$ ***(10 marks)***

2) prove that: $f*(g+h) = f*g + f*h$ ***(10 marks)***

3) $\frac{s+3}{4s^2+4s+1}$ ***(10 marks)***

Part –B
Partial Derivatives and Jacobians

Q1:- Answer two branches only :-

(A) If $v=\frac{1}{\sqrt{t}}e^{-x^2/4a^2t}$, *prove that* $\frac{\partial v}{\partial t}=a^2\frac{\partial^2 v}{\partial x^2}$ ***(10 marks)***

(B) Let $r^2=x^2+y^2+z^2$, $V=r^m$ prove that
$V_{xx}+V_{yy}+V_{zz}=m(m+1)r^{m-2}$

(C) If $u=\sin^{-1}x/y+\tan^{-1}y/x$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=0$ (10 marks) (10 marks)

Q2:- (A) If $w=r^2-2s^2, z=2r^2-s^2$ where $r=x\cos y, s=x\sin y$, prove that $\frac{\partial(w,z)}{\partial(x,y)}=6x^3\sin 2y$

(10 marks)

(B) If $h=r(1-s)$; $i=rs$; show that $JJ'=1$

(10 marks)

" Great success that God Almighty"

22/01/2017

رئيس القسم: ليث وجيه

مدرس المادة: حسنين محمد حمزة

(B) Let $r^2=x^2+y^2+z^2$, $V=r^m$ *prove that*
$V_{xx}+V_{yy}+V_{zz}=m\,(m+1)\,r^{m-2}$

(C) If $u=\sin^{-1}x/y+\tan^{-1}y/x$, *prove that* $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=0$ **(10 marks)** **(10 marks)**

Q2:- *(A) If* $w=r^2-2s^2, z=2r^2-s^2$ *where* $r=x\cos y, s=x\sin y$, *prove that*
$\frac{\partial(w,z)}{\partial(x,y)}=6x^3\sin 2y$

(10 marks)

(B) If $h=r(1-s)$; $i=rs$; *show that* $JJ'=1$

(10 marks)

" Great success that God Almighty "

22/01/2017

رئيس القسم: ليث وجيه

مدرس المادة: حسنين محمد حمزة

جمهورية العراق
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القسم : هندسة تقنيات الاتصالات
المرحلة : الثالثة
المادة: حاسبة
زمن الامتحان: ساعتان
التاريخ: 23 / 1 / ٢٠١٧

امتحان الفصل الأول- العام الدراسي ٢٠١٦/٢٠١٧

NOTE: ANSWER ALL QUESTIONS

Q1:- Use the inverse matrix method to find solution of the following system of equations **(15M.)**

$30x - 25y = 191$
$50y - 25x - 15z = 0$
$35z - 15y = 0$

Q2:- Plot the functions $y_1 = e^{-x}$, $y_2 = \sqrt{\cos(x)}$ for $x = 0:0.1\pi:3\pi$ in one figure, use **(20M.)** different colors and styles, add legend, labels for both axes and title for your figure.

Q3:- Use matlab to evaluate **(4 only):** **(20M.)**

1. $A = (5\ln(\sin(3\pi)) + 9\sqrt[3]{e^4})^5$
2. $B = \sqrt[3]{\log\frac{\sin(\frac{\pi}{2})}{1+\sin(\frac{\pi}{2})} + \tan(\frac{\pi}{2})}$
3. $Z = x^2y + y^2x + \left(\frac{x}{y}\right)$ at $x = 4, y = 3$
4. $S = x^5 + x^3 + 2$ at $x = 1,3,5,7,9$
5. $W = e^{3t} + t^2\sin(4t)\cos^3(3t)$ at t any input value

Q4:a-Write a program to find the following series: **(15M.)**

$$S = 1 + 2^2 + 3^6 + 4^{24} + \ldots\ldots\ldots + n$$

Q4:b-Write a matlab program to form a matrix with number (7) in the main diagonal and number (1) in other positions. **(10M.)**

Q5:- $p1(x) = 6x^5 + 3x^2 + 2x^4 + 15$
$P2(x) = 2x^4 - 4x^3 + 10$ **(20M.)**

Use matlab to find **(4 only):**

1. dp1/ dx.
2. P3 = p1 * p2 .
3. P3 at x = -2.
4. Find $\int p2(x)dx$ with constant (4).
5. $\frac{dp1/dx}{dp2/dx}$.

GOOD LUCK

23/1/2017

Head of department
L.WAJEEH

Examiner
I. ALSHIMAYSAWI

القسم : هندسة تقنيات الاتصالات
المرحلة : الثالثة
المادة: معالجة اشارة رقمية
زمن الامتحان: ساعتان
التاريخ: 2017/ 01 / 24

جمهورية العراق
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إمتحان الفصل الأول- العام الدراسي 2017/2016

NOTES: All questions are compulsory.

Q1/A Find the response of an filter with impulse response $h(n)$ =[1,2,3] to the input sequence $x(n)$ =[1,2,1]. **(15 marks)**

Q1/B Suppose that an analog signal is given as: $(t) = 5\cos(2\pi \cdot 1000t), for\ t \geq 0,$ and is sampled at the rate of 8,000 Hz.

a. Sketch the spectrum for the original signal.
b. Sketch the spectrum for the sampled signal from 0 to 20 kHz.

Q2/ Find the Fast Fourier transform (FFT) using decimation in time (DIT) algorithm for the sequence x(n) = **(-1, 0, 2, 0, -4, 0, 0, 0).** **(10 marks)**

Q3/ **(20 marks)**

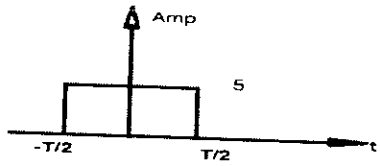
Describe in graphical model the Analog, digital signals for both continuous time and discrete time.

(a) Determine whether the system described by the differential equation **(20 marks).**

$\frac{dy(t)}{dt} + y(t) + 3 = x(t)$ is linear.

(b) Find the energy of a rectangular plus shown in figure below :

$$x(t) = \begin{cases} 5 & -\frac{T}{2} < t < \frac{T}{2} \\ 0 & other\ wise \end{cases}$$



Q4/A sinusoidal wave with frequency 1HZ and amplitude 1V is sampled pulse train 8HZ calculate the discrete Fourier transform for the positive half wave only. **(25 marks)**

Q4/B sketch the signal $x(t) = \begin{cases} 1-t, & 0 \leq t \leq 1 \\ 0, & \text{otherwise} \end{cases}$ then find and sketch

1-x (t+3), 2-x (t-1), 3-x (-t) 4-x (-t+2) **(10 marks)**

With Best Wishes

24/01/2017
رئيس القسم
ليث وجيه عبدالله

مدرس المادة
م.م . قصي جليل الحسني

القسم : هندسة تقنيات الاتصالات
المرحلة : الثالثه
المادة: هوايات
زمن الامتحان: ساعتان
التاريخ: 26/ 01 /2017

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
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إمتحان الفصل الأول- العام الدراسي ٢٠١٦/٢٠١٧

Note : Answer all questions

Q1: Given a magnetic flux field in free space where there is neither charge non-current density **(25 marks)**

$$B = a_x \sin(wt - \beta z) + a_y \cos(wt - \beta z)$$

Where W are constant. Determine the corresponding electric field?

Q2: A: Show that [A circulating electric field is produced by a magnetic field that changes with time] **(13 marks)**

$$\nabla \times E = -\frac{\partial B}{\partial t}$$

B: What is the maximum power received at a distance of **10 km** over a free-space **1 GHz** circuit consisting of a transmitting antenna with a **20 dB** gain and a receiving antenna with a **30 dB** gain? The gain is with respect to a lossless isotropic source. The transmitting antenna input is **250W**. **(12 marks)**

Q3: A: Two extensive homogenous isotropic dielectrics meet on plane **X=0**. For $X \geq 0$ a uniform electric field is $\mathbf{E_1} = \mathbf{10a_x} - \mathbf{4a_y} + \mathbf{3a_z}$ V/m and for $X \leq 0$ $\mathbf{E_2} = \mathbf{5a_x} - \mathbf{5a_y} + \mathbf{a_z}$ V/m and the normal component of electric field density for the second media is $12a_x$. Find the dielectric constants for the two dielectrics ϵ_1 and ϵ_2. **(13 marks)**

B: If the receiving antenna has **vertical polarization** and the transmitting antenna has Find the **Vertical polarization** polarization loss factor (**PLF**)? **(12 marks)**

Q4: The normalized radiation intensity of a given antenna is given by: **(25 marks)**

$$U = B_0 \sin^2\theta \sin\emptyset$$

The intensity exists only in $0 \leq \theta \leq \pi/2$, $0 \leq \emptyset \leq 2\pi$ region, and is zero elsewhere.
Find the **[a]** Maximum power density (in watts/square meter) at a distance of 1 km
[b] Directivity of the antenna (dimensionless and in dB)
[c] Gain of the antenna (dimensionless and in dB), if the antenna has input impedance of 150 ohms, is connected to a transmission line whose characteristic impedance is 50 ohms.
[d] Effective aperture for antenna operating at 1GHz

GOOD LUCK

Note: $\varepsilon_0 = 8.8541878176 \times 10^{-12}$ **C/mv,** $\mu_0 = 4\pi \times 10^{-7}$ **Vs/Am, C0=**3×10^8 **m/s**

$$\nabla \times H = a_x\left[\frac{\partial H_z}{\partial y} - \frac{\partial H_y}{\partial z}\right] + a_y\left[\frac{\partial H_x}{\partial z} - \frac{\partial H_z}{\partial x}\right] + a_z\left[\frac{\partial H_y}{\partial x} - \frac{\partial H_x}{\partial y}\right]$$

26/01/2017

رئيس القسم : ليث وجيه

مدرسة المادة : م.م غفران مهدي حاتم

قسم الاتصالات
ت/٣

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القسم : هندسة تقنيات الاتصالات
المرحلة : الثالثة
المادة: تصميم دوائر الكترونية
زمن الامتحان: ساعتان
التاريخ: ١/ ١/ ٢٠١٦

إمتحان الفصل الاول - العام الدراسي ٢٠١٦/٢٠١٧

Note: answer all questions

Q1/a) The single-phase full wave controlled rectifier has a purely resistive load of R and the delay angle is $\alpha=\pi/2$, determine:

a) The efficiency,

b) The ripple factor RF

(10marks)

b) List the most known of power diodes and explain only one type?

(10marks)

Q2/ A thyristor string is formed by the series and parallel connection of the thyristors. The voltage and current rating of the string are 6kV and 4kA respectively. Available thyristors have the voltage and current rating of 1.2kV and 1kA, respectively. The string efficiency is 90% from both the series and parallel connections. Calculate

1- the number of thyristor to be connected in series and parallel.

2- The values of R and C if the maximum blocking current is 15mA and $\Delta Q_{max}=25\mu C$

(20marks)

Q3/a) Fill in the blank(s) with the appropriate word(s)

1- During rise time the rate of rise of anode current should be limited to avoid creating local _____.

2- A high dv/dt may be caused damage to a thyristor. In order to prodect a thyristor from high dv/dt could be used _____

3- _____ is equally suitable to single motor and muli- motor drivers

4- Bolt – down mounting, this called flat- pack mounting this mounting used for _____

5- Thyristors are connected in parallel to increase _____ capability.

(10marks)

b) List the forced commutation methods and explain one only?

(10marks)

Q4/ answer two branch only

a) Compare between PMOSFET and PBJT

b) Derive the following formula

(10marks)

$$V_D = \frac{V_S + (n_S - 1) R \Delta I_D}{n_S}$$

c) What is the necessity to connecting SCRs in series? What are the problems associated with series connection of SCRs? How are they eliminated?

(10marks)

(10 marks)

Q5/ The SCR is used to control power in resistance R. The supply is 400V, and the maximum allowable di/dt and dv/dt the SCR are 50A/μsec and 200V/μsec, respectively. Compute the values of the di/dt inductor and snubber circuit component R_s and C_s.

(20 marks)

Good luck

29/01/2017

Lecture
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head of department
Laith Wajeh

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القسم : هندسة تقنيات الاتصالات
المرحلة : الثالثة
المادة: نظم اتصالات
زمن الامتحان: ساعتان
التاريخ: 31 / 01 / 2017

إمتحان الفصل الأول- العام الدراسي 2016/2017

(نموذج #1)

Answer All Questions

(50 M)

Q_1/ Choose the correct answers

1- The main advantage of DM over PCM is:
(a) Less bandwidth **(b)** Less power **(c)** Better S/N ratio **(d)** Simple circuitry

2- If peak to peak signal value is *8 volts*, and quantized into *128 levels*, then values of Δ, m and N_q are respectively:
(a) 0.125, 7, $13*10^{-4}$ **(b)** 0.0625, 8, $13*10^{-4}$ **(c)** 0.0625, 7, $52*10^{-4}$ **(d)** none of these

3- The difference between the original analog signal and the translated digital signal is called .....
(a) Pulse Code Modulation **(b)** Sampling **(c)** Quantizing Error **(d)** none of these

4-Sampling theorem: The original analog signal can be reconstructed if it is sampled at a rate at least.
(a) Twice its bandwidth **(b)** Half its bandwidth **(c)** Equal its bandwidth **(d)** none of these

5- The bit rate of a PCM signal can be calculated form
(a) Bit rate = $n^2 \times f_s$ **(b)** Bit rate = $n^{2+1} \times f_s$ **(c)** Bit rate = $n^2 \times f_b$ **(d)** none of these

6- A sinusoidal Signal of amplitude Am uses all Representation levels provided for Quantization in the case of full load condition. Calculate Signal to Noise ratio in db assuming the number of quantization levels to be 512.
(a) 52.8 db **(b)** 60 db **(c)** 55.8 db **(d)** none of these

7- DPCM compares two successive analog amplitude values, quantizes and encodes the difference, than transmits the .....
(a) Same Value **(b)** Previous Value **(c)** Differential Value **(d)** none of these

8-The main tools used to counter ISI is
(a) Companding **(b)** Pulse Shaping **(c)** Zero Value **(d)** none of these

9-Determine (a) the peak frequency deviation, (b) minimum bandwidth, and (c) baud for a binary FSK signal with a mark frequency of 49 kHz, a space frequency of 51 kHz, and an input bit rate of 2 kbps.
(a) Δf=,1Khs Bw=6 Khs, and Baud= 1000 **(b)** Δf=,1Khs Bw=4 Khs, and Baud= 1000 **(c)** Δf=,4Khs Bw=6 Khs, and Baud= 1000 **(d)** none of these

10- A disadvantage of ..... is that changes in the output phase occur at twice the data rate in either the I or Q channel".
(a) CP-FSK **(b)** OQPSK **(c)** MSK **(d)** none of these

(20 M)

Q_2/ State True or False

1. Quantization is done to make the signal amplitude discrete.
2. ASK is also known as on-off keying.
3. Unit of mutual information is bits/message.
4. Noise can be reduced by increasing sampling rate.
5. PCM is a technique which provides a staircase approximation to an over-sampled version of the message signal.
6. In the FSK ,notice that when the output frequency changes, it is a smooth, continuous transition. Consequently, there are no phase discontinuities.
7. In PAM the amplitude of a train of pulse is varied according to the amplitude of the analog signal.
8. The carrier recovery circuit reproduces the original transmit carrier oscillator signal. The recovered carrier must be frequency and phase coherent with the transmit reference carrier.
9. M-ary is a term represents a digit that corresponds to the number of bit.
10. The factor α of raise cosine is called sharp shape factor.

مدرس المادة

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ليث وجيه عبدالله

Q_3/ Answer only two from the following: **(14 M)**

1- Sketch the functional diagram of QPSK transmitter.
2- Sketch the functional diagram of Delta demodulation.
3- Sketch the functional diagram of PCM system with analog companding.

Q_4/ Fill out the following blanks: **(16 M)**

1. A QPSK modulator is a binary signal, to produce _____ different input combinations.
2. Elements of a communication system are _____, _____, _____ and _____
3. In the _____ the amplitude of the sound wave is sampled at regular intervals and translated into a binary number.
4. There are two famous companding techniques are _____ and _____ law.
5. nformation capacity is a linear function of _____ and _____ time and is directly proportional to both.
6. _____ refers to the rate of change of a signal on the transmission medium after encoding and modulation have occurred.
7. Amplitude shift keying(ASK) is sometimes called _____.
8. _____is binary FSK except the mark and space frequencies are synchronized with the input binary bit rate.

31/01/2017

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