Al Muthanna University

College of Science

Department of Mathematics

and Computer Application

Subject: Advance Calculus I

Stage: Second

Date: / /2018
Time: Three Hours

((Final Exam for the Second Semester))
Academic year 2017-2018

28. 05. 2018

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Q1)(a) Find the Fourier series of the given function $f(x) = \begin{cases} -k & -\pi < x < 0 \\ k & 0 < x < \pi \end{cases}$

and show $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$

(b) Let $\{a_n\} = \left(1 + \frac{1}{n}\right)^n$, does this sequence converge or diverge?

Q2)(a) Prove: if the sequence $\{a_n\}$ is convergent then it is bounded.

(b) Express the repeating decimal 1.24123123123… as a rational number.

Q3)(a) Define geometric series and Prove it is : (I) converges to $\frac{1}{1-r}$ $if |r| < 1$

(II) diverges if $|r| \geq 1$

(b) Discuss the convergence of the following series: (1) $\sum_{n=1}^{\infty} \frac{n}{n^2+1} x^n$, $x > 0$

(2) $x - \frac{x^2}{2^2} + \frac{x^3}{3^2} - \frac{x^4}{4^2} + \cdots$

Q4) (a) By using integral test discuss the convergence of the following series :

(i) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ (ii) $\sum_{n=2}^{\infty} ne^{-n^2}$

(b) Find the Fourier series of the function : $f(x) = x$ $0 < x < 2\pi$

Q5)(a)Examine for convergence and absolute convergence of the following series:

(1) $\sum_{k=1}^{\infty} \frac{(-1)^{k-1} k}{k^2+1}$ (2) $\sum_{k=1}^{\infty} \frac{(-1)^{k-1} 2^k}{k^2}$

(b) Find the Maclaurin series for $sinhx$ $sinh(x)$

Note: For each question 12 Mark

Lecturer
Prof. Dr.Hussein J. AbdulHussein

Head of Department
Assist. Prof. Mousa M. Khrajan

2018.6.17

المرحلة : الثانية		وزارة التعليم العالي والبحث العلمي
المـادة : طرق البحث العلمي		جامعــة المـثـنـى
الوقت : ثلاث ساعات		كليـــة العلـــوم
التاريخ : / 2018		قسم الرياضيات وتطبيقات الحاسوب

30. 05. 2018

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((أسئلة الامتحان النهائي للفصل الدراسي الثاني للسنة الدراسية 2017-2018))

السؤال الأول : ما هي الاخطاء الشائعة التي يجب على الباحث تجنبها من وجهت نظر ستيورات ميل؟

------- (10 درجه)

السؤال الثاني : كيف يمكن تُصنيف البحوث العلمية؟ وعلى اي اساس ؟

------- (10 درجه)

السؤال الثالث : تكلم بايجاز عن اخلاقيات البحث العلمي.

------- (10 درجه)

السؤال الرابع : ما هي خطوات البحث العلمي فيما يتعلق بالبحوث التربوية والنفسية. عددها فقط

------- (10 درجه)

السؤال الخامس : هنالك اعتبارات أو شروط لا بد من مراعاتها من جانب الباحث قبل اختياره مشكلة مناسبة للبحث. اشرحها باختصار.

------- (10 درجه)

السؤال السادس : كيف يمكن تصنيف المعارف بحسب مراحلها وخصائصها؟

------- (10 درجه)

جامعة المثنى
كلية العلوم
اللجنة الامتحانية المركزية

تمنياتي لكم بالنجاح

رئيس القسم

أ.م. موسى مكي كريدي

2018.6.13

أستاذ المادة

م.م. أوس نضال ذياب

Note // 6 Marks For Every Equation

1) Find the $L\{f(t)\}$, where $f(t) = \sin 3t \sin 2t$?

2) What is the Laplace transform of the following function
$f(t) = 3t^2 + 6e^{-t} + \sin 2t$?

3) defined ((Unit Step function)) ? And Show that $L\{t^n e^{-at}\} = (-1)^{2n} \dfrac{n!}{(s+a)^{n+1}}$?

4) If $L\{f(t)\} = F(s)$, then $L\left\{\displaystyle\int_0^t f(t)dt\right\} = \dfrac{F(s)}{s}$?

5) What is the Laplace inverse of the following functions :

1) $F(s) = \dfrac{3s+1}{s^2+6s+13}$, 2) $F(s) = \dfrac{1}{s(s-a)}$?

6) Fined the Lap. Trans. of the following periodic function
$f(t) = \dfrac{k}{a}t$, $0 < t < a$?

7) Transform the following equation $\dfrac{dy}{dx} = \dfrac{a_1 x + b_1 y + c_1}{a_2 x + b_2 y + c_2}$, from non homogeneous equation to homogenous equation by using $x = X + h$ and $y = Y + k$?

8) Prove that $F(D^2)\sin bx = F(-b^2)\sin bx$?

9) ((Choose one only))

1) Find $(D^4 + 3D^2 - 1)\sin 2x$?

2) Find $(D^2 - 4D + 1)e^{2x}y$?

10) Solve the following $y''' + y'' - 2y = 6x^2 - 5\cos 2x$?

((Good Luck))

Lecturer
Rafid H.B.

M.M.KRAD
Head of Department
Mousa Makey

2018-6-13

المرحلة : الثانية
المـــادة : حزمة برامج ماتلاب
الوقـت : 3 ساعات
2018/

سيم العالي والبحث العلمي
جــامـعــة الـمـثـنـى
كليــــة العلــوم
قســـم الرياضيات وتطبيقات الحاسوب

05. 06. 2018

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((أسئلة الامتحان النهائي للفصل الدراسي الثاني للسنة الدراسية 2018/2017))

س1/ ما وضيفة الاوامر التالية: (اجب عن ثمانية فقط)   (8 درجة)

1. rem(x,y)   2. repmat(A,rows,cols)   3. complex(x,y)   4. prod(diag(A))

5. linspace(2,10,100)   6. subplot(n ,m,p)   7. round(x)   8. conj(z)

9.cart2sph(x,y,z)

س2/ لديك المصفوفة التالية G=[1 2 3; 4 5 6; 6 7 8] ماذا يحدث عند تنفيذ الاوامر التالية:

اجب عن اربعة فقط   (8 درجة)

1. G(3,1:3)=[10,20,30]   2. A=sort(G,1, 'descend')   3. S=G(end,end)

4.R=G.^2   5. C=G^2

س3/ اكتب برنامج بلغة ماتلاب لرسم الدالة التالية رسم ثلاثي الابعاد   (8 درجة)

$z = x^2 e^{\sqrt{y}} + \dfrac{\ln(x+2)}{x\sinh(y)}$ خذ ($0 \geq x = y \geq 10$) واضف الخصائص التالية للرسم: 1.سم المحاورواضبط

حجم النص على 12   2.اضبط سمك الخط البياني على 3نقاط   3.اضف اسم للشكل   4.اضف شبكة للرسـم

س4/ باستخدام برنامج ماتلاب جد مايلي: (8 درجة)

1. $\dfrac{d}{d\omega}(\pi \sin(\omega/2\pi))$ 2. $\iiint 3re^{r^2} \sin\theta\, drd\theta d\varphi$ 3. $\int_0^2 \int_0^{2\pi} xy\cos(x^2)dxdy$ 4. $\iint \dfrac{(r^2-1)}{(r\cos(\theta))^2} \dot{}drd\theta$

س5/ اعد كتابة البرنامج التالي بصورة صحيحة   (8 درجة)

```
% Rloess method
x=xlsread(filename,'A1:A20');
```

رئيس القسم

أ.م.موسى مكي خريجان

يتبع

استاذ المادة

م.علي ناظم صبار

وزارة التعليم العالي والبحث العلمي

جامعة المثنى

كلية العلوم

قسم الرياضيات وتطبيقات الحاسوب

المرحلة : الثانية

المادة : حزمة برامج ماتلاب

الوقت : 3 ساعات

2018/

44

((أسئلة الامتحان النهائي للفصل الدراسي الثاني للسنة الدراسية 2018/2017))

```
y1=xlsreed(filename, sheet1, B1:B20);
y2=xlsread('filename','sheet1','C1:A20');
s1=smoth(x,y1,0.1,rloess);
s2=smooth(x,y1,0.2,'rloess');
plot(x,s1)
plot(x,s2)
legend('s1',s2)
```

تمنياتي لكم بالنجاح

رئيس القسم

أ.م.موسى مكي خريجان

2018. 6. 13

استاذ المادة

م.علي ناظم صبار

Note: Answer all the questions.   (15M) أو (15 Marks)

Q1//Make a sentences using the expressions listed below.(five only)(15m)
  1-verb+to+infinitive. 2-verb+preposition+ing. 3-Any is used with question.
  4-A few is used with count noun. 5-Much is used with noncount noun.
  6-The first conditional is used to express a possible condition and a probable
  result in the future.

Q2//Put the verb into the correct form, past simple. (five only)(15m)
1-Mozart--------(write)more than 600 pieces of music. 2-When I--------
(get)home last night. 3-Geroge--------(not/be)very well last week.
4-Mr.Clark--------(work)in a bank for 15 years. 5------------(you/go)to the last
night? 6-My grandfather----------(die) 30 years ago .

Q3//Make the questions.(five only)(15m)
1-A:I hope to go to university. B:(what/want/study?)-----------------------------------
2-A:One of my favorite hobbies is cooking. B:(what/like/make?)------------------
3-A:I get terrible headaches. B:(when/start/terrible/?)-----------------------------
4-A:We are planning our summer holidays at the moment.B:(where/they/go?)--
5-A:I am tired. B:(what/like/do/tonight)--
6-A:They leave. B(why/leave/yesterday)---

Q4//Make a sentences from the words in brackets. Use the Present
Perfect.(five only).(15m)   (15M)
1-(it/not/rain/this week)---
2-(the weather/be/cold/recently)------------------------------
3-(it/cold/last week)---
4-(I/not/read/a newspaper today)-----------------------------
5-(Ann/earn/a lot of money/this year)------------------------

M.M.KPAK
Assistant Prof. Mousa Makey
Head of Department

Saad Paddy
Lecturer

2018.5.13

((Assessment of the final exam for the Second semester))

Academic year 2017 -2018

45

Note : 12 marks for each question(answer 5 only)

Q1:- Let f(x) = $3x^2/8$, X∈ Ω = {X: 0 < x < 2 }and let A_1 = {X : 0 < x < 0.5 }and A_2 = {X : 1 < x < 2} be two subsets of Ω . Find P(A_1∩A_2) and P(A_1UA_2) ?

Q2:- Let X and Y be two joint discrete random variables where

(x,y)	(1,1)	(1,2)	(1,3)	(1,4)	(2,2)	(2,3)	(2,4)	(3,3)	(3,4)	(4,4)	o.w
f(x,y)	1/16	1/16	1/16	1/16	2/16	1/16	1/16	3/16	1/16	4/16	0

Find
a) The j.c.d.F. of X and Y ?
b) f(2,2) and f(3,3) by using C.d.F ?
c) P(1< x ≤ 3 , 2 < y ≤ 4) by using C.d.F ?

Q3 :– Let   the   j.p.d.f $f(x,y) = \begin{cases} 4xye^{-(x^2+y^2)}, & 0 < x,y \\ 0 & , \qquad o.w. \end{cases}$,Are X and   Y   independent   ?

Q4:- If X be a r.v. with m.g.f. $M_x(t)$, a and b are any two constants ,prove that

$$i)M_{bx}(t) = M_x(bt)$$

$$ii)M_{\frac{x+a}{b}}(t) = e^{\frac{a}{b}t} M_x(\frac{t}{b})$$

Q5:- Three light bulbs are chosen at random from 15 bulbs of which 5 are defective , find the probability that
A=No one is defective ?
B=Exactly one is defective ?
C=At least one is defective ?

Q6:- A box contains black and white balls , each ball is labeled either A or Z . the composition of the box is shown below:-

Label	Black	White	
A	5	3	8
Z	1	2	3
	6	5	11

Let us now assume that a ball is to be selected at random from this box .what is the probability of getting a black ball if it was labeled A ?

Best of luck

Lecturer
ALAA H. SABRI

M.M.KRADI
Head of Departmen
MUSA M. KRAIDI

2018-6-13

((Assessment of the final exam for the second semester))
Academic year 2017-2018 ·

Q1// a) Show that every two composition chains are equivalent in $(Z_{20}, +_{20})$. Why?

b) Give an example for each of the following:

i) $[a,b] \neq e$, $a,b \in G$ (group).   **[12 Marks]**

ii) A normal but not a composition chain.

iii) A maximal normal subgroup.

Q2// **Prove or disprove** each of the following:

a (i) Any normal subgroup is a self conjugate.   **[12 Marks]**

b (ii) Non abelian groups have no normal chain.

c (iii) The commutator of a and b $[a, b] = e$, $\forall\, a,b \in G$.

Q3// a) State and apply Cauchy theorem on $(Z_9, +_9)$ ·

b) Let $G = \{1, -1, i, -i, j, -j, k, -k\}$ be a group such that $i^2 = j^2 = k^2 = -1$

Use class equation (I) to show that $|G| = 8$.   **[12 Marks]**

Q4// Prove each of the following:

a) A subgroup H of a group G is a self conjugate if and only if $C(H) = H$.

b) A normal subgroup H of a group G is a maximal if and only if the quotient group $(G/H, *)$ is simple.   **[12 Marks]**

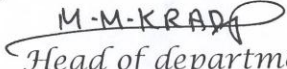Q5// a) Give a composition chain in each of the following groups:

i) (S_3, o) **[12 Marks]**

ii) $(Z_{60}, +_{60})$

b) State then apply the 3rd Sylow theorem to find the number of all Sylow 2- subgroup in $(Z_{24}, +_{24})$.

Lecturer
Asst.lecturer Zaid AL-Saeed

M·M·KRADY
Head of department
Asst.prof. Mousa Krady

2018. 6. 12

((Assessment of the final exam for the second semester))
Academic year 2017-2018

Remark\\ Twelve marks for every equations

Q1\ A\Consider the basis $S = \{A_1, A_2, A_3\}$ for R^3, where $A_1 = (1,1,1)$, $A_2 = (-1,0,-1)$, and $A_3 = (-1,2,3)$. Use the Gram-Schmidt process to transform S to an orthogonal basis for R^3.

B\ Let $L : R^3 \to R^3$ be defined by $L\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} x+1 \\ 2y \\ z \end{bmatrix}$. Does $L : R^3 \to R^3$ be a Linear transformation?

Q2\ A\Let $L : R^2 \to R^2$ be a Linear transformation for which we know that $L\left(\begin{bmatrix} 1 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} 2 \\ -3 \end{bmatrix}$,and $L\left(\begin{bmatrix} 0 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

(1) what is $L\left(\begin{bmatrix} 3 \\ -2 \end{bmatrix}\right)$?   (2) what is $L\left(\begin{bmatrix} a \\ b \end{bmatrix}\right)$?

B\ State and prove Cauchy- Schwarz inequality.

Q3\ A\ Let $L : R^4 \to M_2(R)$ be a Linear transformation defined by $L(x, y, z, w) = \begin{pmatrix} 2x & y \\ z & 3w \end{pmatrix}$. Find $\dim(\ker L)$ and $\dim(range L)$?

B\ Find the Eigen values and the Eigen vectors for the following matrices:

(1) $A = \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$ (2) $B = \begin{pmatrix} -1 & 5 \\ 1 & 3 \end{pmatrix}$

Q4\ A\ Let V be a vector space of all continuous real valued functions which defined in $[0,1]$ by $\langle f, g \rangle = \int_0^1 f(t)g(t)dt$, $\forall f, g \in V$. Does $(V, \langle .,. \rangle)$ be an inner product space?

B\ Write each of the following quadratic forms as $X^T A X$.
(1) $x^2 - 4xy - 3y^2 + 6yz + 4z^2$ (2) $4x^2 - 6xy + 2y^2$ (3) $-2xy + 4xz + 6yz$

Follow to →

جامعة المثنى
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2018.6.13

((Assessment of the final exam for the second semester))
Academic year 2017-2018

45

Q5\ A\ A manufacturer of a certain chemical product has two plants where the product is mad. Plant X can make at most 30 tons per week and plant Y can make at most 40 tons per week. The manufacturer wants to make a total of at least 50 tons per week. The amount of particulate matter found weekly in the atmosphere over a nearby town is measured and found to be 20 pounds for each ton of the product made by Plant X and 30 pounds for each ton of the product made by Plant Y. How many tons should be made weekly at each Plant to minimize the total amount of particulate matter in the atmosphere.
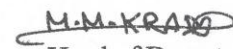
B\ Find the graph of the following matrix

$$(1) M(G) = \begin{bmatrix} 0 & 2 & 1 & 0 & 0 \\ 2 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 2 \\ 0 & 0 & 1 & 2 & 0 \end{bmatrix} \qquad (2) A(G) = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

Best Luck

Lecturer
Zainab Hayder

M.M.KRA
Head of Department
Asst.Prof.Mousa Makey