Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
and computer applications

Subject :Group theory II
Stage :Second stage
Date: 26/5/2024
Time : 3 hours

26 MAY 2024

((Assessment of the final exam for the 2nd semester))

45

Academic year 2023 -2024

Note: Answer all question.

Q1/ Answer the following: **(15 Mark)**

1) Define: 1- External direct product 2- P-group 3- The chain
2) No group of order 20 is simple, prove that.
3) Let $(Z_{12}, +_{12})$, *Prove that* $Z_{12} \supset \langle 2 \rangle \supset \langle 4 \rangle \supset \{0\}$ is composition chain.

Q2/Answer the following: **(15 Mark)**

1) Prove that, if G is finite, $G = H \otimes K$, then $O(G) = O(H).O(K)$.
2) Prove that, let G be P −group and $H \trianglelefteq G$, then both H and G/H are P −group.

Q3/ Answer the following: **(15 Mark)**

1) Prove that, $C(a)$ is a subgroup of a group G.
2) Prove that, every group of order p^2, where p is prime is abelian.

Q4/ Answer the following: **(15 Mark)**

1) Prove that, No non abelian P −group is simple.
2) Prove that, let H be a subgroup of G and $a \in G$, then aHa^{-1} is also subgroup of G and $O(H) \simeq O(aHa^{-1})$.

Best of luck

كلية العلوم
قسم علوم الرياضيات وتطبيقات الحاسوب
اللجنة الامتحانية

Lecturer
Ghadeer K. Saeed

Head of department
Assist prof. Rafid H. Buti

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
and computer applications

Subject: Electrical physics
Stage: First stage
Date: 30/6/2024
Time: 3 H

30 JUN 2024

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

45

Academic year 2023 -2024

ملاحظة: الاجابة عن خمس اسئلة فقط (لكل سؤال عشر درجات)

س1: وضعت ثلاث شحنات نقطية مقدارها (qC) على رؤوس مثلث متاوس الاضلاع. احسب القوة التي تؤثر على كل شحنة إذا علمت ان طول ضلع المثلث يساوي $(10\ cm)$

س2: اشرح قانون كولوم بالتفصيل

س3 : شحنة موزعة بانتظام بشكل مستوي مساحته لانهائية وبكثافة سطحية $(\sigma\ \frac{C}{cm^2})$. احسب شدة المجال الكهربائي (E) عند النقطة (P) الواقعة على بعد (a) من المستوي

س4 : عرف ثنائي القطب الكهربائي مع ذكر خصائص خطوط القوة الكهربائية للمجال الناشئ عن ثنائي القطب الكهربائي

س5 : سلك طويل مستقيم طوله غيرمحدد يحمل شحنة موجبة موزعة بصورة منتظمة بكثافة فيض قدرها (λ) .احسب باستخدام قانون كاوس شدة المجال الكهربائي عند نقطة تبعد مسافة قدرها (a) عن الشحنة

س6 : احسب المجال الكهربائي الناشئ عن شحنة نقطية باستخدام قانون كاوس.

كليـة العلـوم
قسم علوم الرياضيات وتطبيقات الحاسوب
اللجنة الامتحانية

Best of luck

Lecturer
Lecturer Bashar.hawi. azeez

Head of department
Assist prof. Rafid H. Buti

Ministry of Higher Education & Scientific Research
Al-Muthanna University
College of sciences
Department Of Mathematics and Computer Applications

Subject: SPSS Program
Stage: Second stage
Date: 21 / 5/2024
Time: 3 Hours

21 MAY 2024

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

45

Academic year 2023-2024

ملاحظة : الأجابة عن جميع الأسئلة ولكل سؤال (8) درجات

س1// أجب عن الآتي :

1- يتكون برنامج SPSS من عدة أنواع عدد أثنين فقط بالتفصيل ؟

2- يتضمن عمود Measure في ورقة Variable View ثلاثة مقايس ، عدد أثنين فقط موضحاً نوع البيانات التي تستعمل مع كل مقياس مع ذكر مثال ؟

س2// من ضمن قوائم Menu في برنامج SPSS قائمة التحويلات Transform تحتوي هذه القائمة على مجموعة من الاوامر عدد أربعة من هذه الاوامر مع ذكر وظيفة كل أمر ؟

س3// اجب عن الآتي :

أ- أنسب أربعة فقط من الأوامر الأتية الى القوائم المناسبة :

1- Tool bars 2- Merge File 3 - Compute Variable 4 - Frequencies 5- Define date and time

ب- مامعنى الدلالة الاحصائية ؟

س4// ماهو الفرق بين أختبار التوزيع الطبيعي للعينة وأختبار تجانس التباين ؟

س5// أجب عن فرعين فقط :

أ- أكتب خطوات (المسار الصحيح) لحساب دالة مشروطة لبيانات مدخلة في برنامج SPSS ؟

ب- أكتب الوظيفة المناسبة لأربعة فقط من الأوامر الأتية :

1- Value Labels 2- Go to Case 3- Insert Case 4- Undo 5-Weight Cases

ت- ماهو الفرق بين الأمر Frequencies والأمر Explore

تمنياتي لكم بالنجاح

Lecturer
Lecturer. Ayad R.Jalfan

Head of department
Dr.Rafid H . Buti

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
and computer applications

Subject : اخلاقيات المهنة
Stage Fourth stage
Date: 19/5/2024
Time : 3 H

14 MAY 2024

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

45

Academic year 2023 -2024

ملاحظة // الاجابة بالقلم الجاف

السؤال الاول // عرف ما يأتي (15 درجة)

1- المنافسة غير المشروعة 2- المهنة 3- الحرفة 4- الفساد الاداري 5- الاخلاق

السؤال الثاني // ضع كلمة (صح) امام العبارة الصحيحة وكلمة (خطأ) امام العبارة الخاطئة . (15 درجة)

1- الافصاح المالي هو اجراء تنص عليه سياسات منع تضارب المصالح ولا يلتزم الموظفون بموجبه .

2- ان مسؤولية الفرد عن نفسة وعن اسرته واصدقائه وعن دينه ووطنه تسمى المسؤولية الاجتماعية .

3- تكون المنافسة غير مشروعة عندما يقوم المنافس باستخدام وسائل وطرق منافية للقانون .

4- انجاز القليل من الاعمال يحسن من سمعة الشركة وكذلك يرفع من مكانتها في سوق العمل .

5- من اهم اخلاقيات المهنة المذمومة في الاسلام هي الكذب ، الغش ، الرشوة ، الظلم و الاعتداء .

السؤال الثالث // املا الفراغات التالية بما يناسبها لكل مما يأتي : (15 درجة)

1- تتكون عناصر المسؤولية الاجتماعية من ثلاثة عناصر هي --------- و--------- و--------- .

2- تسمى الظاهرة التي يقوم بها البعض في تشجيع العمال على التظاهر ضد الشركة بـ ---------- .

3- ان المخالفات المالية والادارية التي تتصل بسير العمل العائد للموظف تسمى ------------- .

4- ان المسؤولية التي تعني معرفة حدود الله واوامره ونواهيه والبعد عن المحرمات تسمى --------- .

5- --------- هي النوع الذي يلجأ فيه المنافسين الى استخدام اساليب شيطانية للفوز على منافسيهم

السؤال الرابع // تحدث بالتفصيل عن المسؤولية الاجتماعية . (15 درجة)

كلية العلوم
قسم علوم الرياضيات وتطبيقات الحاسوب
اللجنة الامتحانية

مع امنياتنا لكـــم بالتوفيق

Lecturer
م. مثنى توفيق الموسوي

Head of department
Assist prof. Rafid H. Buti

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
and computer applications

12 MAY 2024

Subject : Operations Research
Stage : Fourth stage
Date: 12/ 5/2024
Time : 3h

12 MAY 2024

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

45

Academic year 2023 -2024

Note: Answer all question. موافقة الإجابة بالقلم الرصاص

Q1/ **(15 Mark)**

1) **Solve the following LPP by the graphical method:**

$max z = 10x_1 + 12x_2$

s.t. $2x_1 + 6x_2 \leq 36$

$10x_1 + 4x_2 \leq 50$

$x_1, x_2 \geq 0$

2) **In this table, choose the optimal strategy in case of maximizing profits and reducing costs by using pessimism criterion.**

S_i \ H_i	H_1	H_2	H_3	H_4
S_1	15	32	27	9
S_2	14	19	25	29
S_3	34	26	39	27
S_4	25	34	13	25

Q2/ Solve the following LPP by the Big-M method: **(15 Mark)**

$$max z = 2x_1 + 3x_2 + 4x_3$$
$$\text{s.t. } 3x_1 + x_2 + 4x_3 \leq 600$$
$$2x_1 + 4x_2 + 2x_3 \geq 480$$
$$2x_1 + 3x_2 + 3x_3 = 540$$
$$x_1, x_2, x_3 \geq 0$$

Q3/ Solution the transportation problem by using North-West corner Method. **(15 Mark)**

D_j \ S_i	D_1	D_2	D_3	a_i
S_1	8	12	3	20
S_2	10	6	11	15
S_3	1	4	8	10
S_4	7	11	5	25
b_j	30	25	15	70 \ 70

Lecturer
Ghadeer K. Saeed

Head of department
Assist prof. Rafid H. Buti

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
and computer applications

Subject : Foundation of mathematics
Stage :first stage
Date: 11/5 /2024
Time : 3 H

11 MAY 2024

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

45

Academic year 2023 -2024

Q\\ Answer with word True or False :

1- $f(x)$ is injective iff $f(x)$ is surjective and bijective .

2- If (z , +, ·) is a mathematical system s.t Z be the set of integral number then [1,0] is an identity element of multiplication operation .

3- If $a\,.x|\,b\,.y$ then $x|\,y$ when $a\neq 0$.

4 – the mathematical system (Q , +, ·) is integral domain .

5 – there isn't invers element to $a\in z$ w.r.t ($\cdot$) operator

.**(20mark)

Q2\\ let $(R,*)$ is a mathematical system which denoted by $a*b=\max\{a,b\}$,show that $(R,*)$ is semi-group.

.**(10mark)

Q3\\ let $R=\{(A,B)\in P(x)*P(x):A\subset B\}$ if X is a non empty set , proof R is partial order relation over $P(x)$.

.**(10 mark)

Q4 \\ Prove the mathematical system $(z,+)$ is a belian group

s.t $(a+b)=[m+p,n+q]$ for all $a=[m,n]$, $b=[p,q]$, $a,b\in Z$

.**(10 mark)

Q5 \\ if $f:R\to R$ denoted by $f(x)=x^2$,Find $f^{-1}(\{1\})$ and $f^{-1}(\{-1,4,16\})$

**(10 mark)

Best of luck

Lecturer
Lecturer Banin Shakir

Head of department
Assist prof. Rafid H. Buti

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
& computer applications

Subject :Mathematical statistic II
Stage :Third stage
Date: 11 /5 /2024
Time : 3 hours

11 MAY 2024

((Assessment of the final exam for the 2nd semester))

45

Academic year 2023 -2024

ملاحظة: الاجابة بالقلم الرصاص

Note: Twelve marks for every question

Q1\ Fill in the blanks:

1- If X is a random sample such that $X \sim N(\mu, \sigma^2)$ then $\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$ is …..estimator of σ^2.
2- If T is an biased estimator for θ then T is called efficient estimator for θ iff …….
3- The simple Hypothesis is ……….for example…….
4- If X_i,i=1,2,…,n is a random variable such that $X_i \sim exp(\theta)$ then $E(X_i)$=………and $\operatorname{var}(X_i)$=…….

Q2\ Answer with the word True or False:

1- The estimator θ is said to be consistent estimator of θ if $\lim_{n\to\infty} \operatorname{var}\theta = 0$.
2- The size of type I error is $\alpha = \{x_1, x_2, ..., x_n \in C \mid H_0\}$.
3- The composite Hypothesis is probability of β.

Q3\ Let x random variable has pdf $f(x,\theta) = \begin{cases} \theta^x (1-\theta)^{1-x} & x = 0,1 \\ 0 & o.w \end{cases}$

Test the simple Hypothesis $H_0 : \theta = \frac{1}{4}$ against $H_1 : \theta < \frac{1}{4}$ suppose the critical region is $c = \{x_1, x_2, ..., x_{10} : \sum_{i=1}^{10} x_i \le 1\}$ find:

1- the power of test at $\theta = \frac{1}{16}$ 2- Pr{*type II error*} at $\theta = \frac{1}{16}$

Q4\ Consider the $x \sim bin(5, \theta)$ under $H_0 : \theta = \frac{1}{2}$, $H_1 : \theta = \frac{3}{4}$

The following table gives the density values of x under H_0 and H_1

x	0	1	2	3	4	5
$F(x, \frac{1}{2})$	$\frac{1}{32}$	$\frac{5}{32}$	$\frac{10}{32}$	$\frac{10}{32}$	$\frac{5}{32}$	$\frac{1}{32}$
$F(x, \frac{3}{4})$	$\frac{1}{1024}$	$\frac{15}{1024}$	$\frac{90}{1024}$	$\frac{270}{1024}$	$\frac{405}{1024}$	$\frac{243}{1024}$

كلية العلوم
قسم علوم الرياضيات وتطبيقات الحاسوب
اللجنة الامتحانية

((قلب الصفحة))

Lecturer
Lecturer. Zainab Hayder

Head of department
Assist.Prof.Dr. Rafid Habib Buti

Ministry of Higher Education
& Scientific Research
AL-Muthanna University
College of Science
Department of

Subject: Mathematics IV
Stage: Second

Date: 23/5/2024
Time : 3 hours

23 MAY 2024

((Final exam for the second semester))
2023 -2024

45

Q1. (a) Show that the equation $y = C_1e^x + C_2e^{2x} + x$ is a general solution of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2x - 3$ and find particular solution satisfied by the point (0.0) and (1.0). (10 Marks)

8

Q2. Obtain the differential equation associated with the following equations. (12 Marks)

(a). $y = Cx^2 + C^2$ (b). $y = C_1e^{2x} + C_2e^x + C_3$

1 6

Q3. Determined the type of the following differential equations. (6 Mark)

(1). $xdy - ydx - (\sqrt{x^2 - y^2})dx = 0$, (2). $2x(ye^{x^2} - 1)dx + e^{x^2}dy = 0$

2 2

Q4. Find the integral factor of the following differential equations and solve each equation.

(1). $\frac{dy}{dx} - y = xy^5$, (2). $x^2\frac{dy}{dx} + xy = x^3 + 1$ (12 Marks)

1 5

Q5. Solve the following differential equations. (12 Marks)

(1). $y\frac{d^2y}{dx^2} + (\frac{dy}{dx})^2 = \frac{dy}{dx}$, (2). $\frac{d^2y}{dx^2} = \frac{1}{x}(\frac{dy}{dx} + 1)$

1 2

Q6. By using homogeneous method solve the following differential equation. (8 Mark)

5

$$(x^3 + y^3)dx - 3xy^2dy = 0$$

36
34
70

Lecturer
Salah.A. Hassan

كلية العلوم
قسم علوم الفيزياء
اللجنة الامتحانية
السياحة

أ.م.د

Head of Department

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية العلوم
قسم : الرياضيات وتطبيقات الحاسوب

المرحلة : الثانية
المادة : حاسبات - ماتلاب
الوقت : ثلاث ساعات
التاريخ : 2024/5/23

23 MAY 2024

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((أسئلة الامتحان النهائي للفصل الدراسي الثاني للسنة الدراسية 2023- 2024))

السؤال الأول - اجب عن جميع الفروع التالية : (10) درجة

1- كيف تحفظ ملف ماتلاب باسم ومكان معين ؟ وكيف يتم فتح مشروع سابق
2- ما هو الفرق بين الأمرين clc و clear ؟ واين نستخدم الامر Close all وماهو فائدته
3- كيف يتم ايجاد الجزء الحقيقي والتخيلي لرقم مركب بين الاجابة بمثال ؟

السؤال الثاني - اجب عن الاتي باختصار. (10) درجة

1- عرف برنامج الماتلاب واشرح اهم نوافذة وماذا يحدث فيها من عمليات.
2 - عرف الرسم الثنائي الأبعاد واذكر خمسا من خصائص الرسم.
3- عرف المتجه واذكر انواعه ثم اعطي مثال لكل نوع .
4- ماهو M file وماهي فائدته وشروط تسمية اي فايل فيه وخطوات تنفيذه.
5- كيف يتم وضع جملة التعليق او الملاحظة في البرنامج.
6- عرف المتغيير الحرفي وكيف يتم استخدامه في البرنامج.

السؤال الثالث اجب عن مايلي . (10) درجة

نفذ العمليات التالية على المتجه الذي يتكون من العناصر Z =[20;4;-6;8;10;-12;14;16;2.5;0]

1-اوجد طول المتجه .
2- استبدال العنصر في الموقع الرابع بالرقم 5
3- أحذف العناصر من الموقع 7 الى الموقع 9.
4- اوجد حاصل ضرب عناصر المتجه.
5- اوجد القيمة المطلقة للمتجه.

السؤال الرابع (10) درجة

اكتب برنامج يقوم بحساب اكبر واصغر نقطة لمتجه ثم ارسم حاصل ضرب هاتيين النقطتيين وكتابه نص فوقة (Production) للدالة التاليه ،ثم قم بتسميه الرسم والمحاور مع وضع خصائص اللون والشكل و شبكة الرسم (افرض قيم X كمتجه).

Y=sin(X).*exp(-0.3X)

تمنياتي لكم بالنجاح

كلية العلوم
قسم علوم الرياضيات وتطبيقات الحاسوب
اللجنة الامتحانية

أسم وتوقيع
أستاذ المادة
م.م. صفاء سلام حاتم

رئيس القسم
ا.م.د. رافد حبيب بطي

Ministry of Higher Education
& Scientific Research
Al-Muthanna University
College of Science
Department of Mathematics
& Computer Applications

Subject: Dynamical System II
Stage: Fourth stage
Date: 7/6 /2024
Time: 3 hours

27 JUN 2024

((Assessment of the final exam for the 2nd semester))

45

Academic Year 2023 -2024

Note: 12 Marks for each question

Q1)(a) Find the general solution of the system ,and sketch a portrait for the system

$$\frac{dx}{dt} = 3x - 4y$$

$$\frac{dy}{dt} = x - y$$

(b) Find the fixed point of Henon map.

Q2)(a) Determine whether the fixed point of F are attracting ,repelling or saddle points.

$$F\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2xy + y \\ 3y - x \end{pmatrix}$$

(b) Define Baker's function and graph B_0^1 and B_0^2

Q3)(a) Find the eigenvalues of L.and discuss the dynamics of L where $L\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4y \\ -x \end{pmatrix}$

(b) Prove :let $L: R^2 \longrightarrow R^2$ have the property that A_L has distinct real eigenvalues γ *and* μ, *with* $|\gamma| < 1$ and $|\mu| < 1$ then for every v *in* R^2 , $L^n(v) \to 0$ as $n \to \infty$. Therefore zero is attracting fixed point and R^2 is basin of attraction.

Q4)(a) Find A_{L^n} where $A_L = \begin{pmatrix} 1 & 1 \\ -2 & 4 \end{pmatrix}$

(b) Show that :$\begin{pmatrix} 0 & b \\ 0 & 0 \end{pmatrix} \approx \begin{pmatrix} 0 & 0 \\ c & 0 \end{pmatrix}$ where b *and* $c \neq 0$.

Q5)(a) Prove: let $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ be any matrix, if A has two complex eigenvalues $\beta + i\gamma$, $\beta - i\gamma$ then A similar to the form $\begin{pmatrix} \beta & -\gamma \\ \gamma & \beta \end{pmatrix}$.

(b) Classify the critical point (0) ,and then sketch a portrait the solution:

$$\frac{dx}{dt} = -4x + y$$

$$\frac{dy}{dt} = 3x - 2y$$

Prof. Dr. Hussein J. AbdulHussein

Head of department
Assistant. Prof. Dr. Rafid H. Buti

Ministry of Higher Education
& Scientific Research
Al Muthanna University
College of Science

Subject: Mechanics and Properties of Materials II
Stage: The first
Date: 29/6/2024
Time: 3 hours

((Final Exam/2nd Semester))
2023-2024

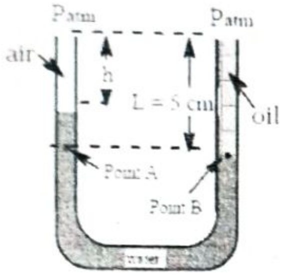
29 JUN 2024

45

Note: Answer only five questions

Q1: Explain the concept of surface tension **(7 Mark)**

Q2: Placing oil above water in a U-shaped tube leads to the displacement of air to the other side, as in the figure below. Find the height of the air column, h, and if the air passes over the left tube, what is its velocity, knowing that the density of the air is $\rho_a = 1.29\ kg/m^3$ and the density of the oil is $\rho_o = 750\ kg/m^3$?



(7 Mark)

Q3: Derive a mathematical expression for the Navier and Stokes equation **(7 Mark)**

Q4: If the velocity of an incompressible fluid is $\vec{v} = 2xy\hat{i} - x^2y\hat{j}$ Is this flow real (physical)? Explain that **(7 Mark)**

Q5: Derive a mathematical expression for Bernoulli's equation **(7 Mark)**

Lecturer
Bashar.Hawi. Azeez

Assist. Prof.Dr. Muwafaq Fadhil
Head of Department

7-6 السبت

Ministry of Higher Education & Scientific Research
Al-Muthanna University
College of sciences
Department Of Mathematics and Computer Applications

Subject: SPSS Program
Stage: Second stage
Date: 6/7/2024
Time: 3 Hours

06 JUL 2024

45

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

Academic year 2023-2024

ملاحظة : الأجابة عن جميع الأسئلة ولكل سؤال (8) درجات

س1// أجب عن الآتي :

1- تتكون نافذة محرر البيانات في برنامج SPSS من عدة أجزاء وضحها بالتفصيل ؟
2- ماهو الفرق بين Data View & Variable View في نافذة محرر البيانات Cell Editor Bar ؟

س2// من ضمن قوائم Menu في برنامج SPSS قائمة ملف File تحتوي هذه القائمة على مجموعة من الاوامر عدد أربعة من هذه الاوامر مع ذكر وظيفة كل أمر ؟

س3// اجب عن الآتي :

أ- أنسب أربعة فقط من الأوامر الأتية الى القوائم المناسبة :

1- Descriptive 2- Automatic Recode 3 - Transpose 4- Status Bar 5- Import Data

ب- مامعنى الدلالة الاحصائية ؟

س4// ماهو الفرق بين أختبار التوزيع الطبيعي للعينة وأختبار تجانس التباين ؟

س5// أجب عن فرعين فقط :

أ- أكتب خطوات (المسار الصحيح) لدمج ملفين يحتويان على نفس المتغيرات وحالات مختلفة ؟

ب- أكتب الوظيفة المناسبة لأربعة فقط من الأوامر الأتية :

1- Select Cases 2- Split File 3- Insert Variable 4- Variables 5- Dialog Recall

ت- مالمقصود باأختبار مربع كاي Chi- square (X^2)؟

تمنياتي لكم بالنجاح

Lecturer
Lecturer. Ayad R.Jalfan

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Dr.Rafid H . Buti

Ministry of Higher Education
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Al-Muthanna University
College of Science
Department of Mathemetics
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Subject: Numerical analysis II
Stage: Third
Date: 6 / 7 /2024
Time : 3 hours

0 6 JUL 2024

45

((Assessment of the final exam for the second semester))
Academic year 2023-2024

Q1\\ Use Adams- Bashforth's four steps method to solve the following IVP

$$y' = \frac{1+t}{1+y}, \quad 1 \le t \le 2,, \ h = 0.1 \text{ and actual solution } y(t) = \sqrt{t^2+2t+6} - 1$$

--(8 Marks)

Q2\\ Solve the following integral by using Simpson's rule

$$\int_0^1 \frac{sin(x)}{x} dx, \ n=4$$

--(8 Marks)

Q3\\ Use the following data to find an approximation of the form $y= ax^2+bx+c$

x	0.1	0.2	0.3	0.4	0.5	0.6
y	0.9003	0.8024	0.7077	0.6174	0.5323	0.4530

--(8 Marks)

Q4\\ Use Eular's method to solve

$$y' = -y + t\sqrt{y}, \quad 2 \le t \le 3, \ y(2) = 2, \ h=0.25$$

--(8 Marks)

Q5\\ Prove the following IVP well-posed problem

$$y' = e^{t-y} \quad 0 \le t \le 1 \ , y(0) = 1$$

--(8 Marks)

Best of luck

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Subject: Semiconductor
Stage: Third

Date: 6 / 7 /2024
Time : 3 hours

((Final exam for the second semester))

2023 -2024

45

Q1: -Prove that the concentration of holes in valance band in intrinsic semiconductor is given by . $P_0 = N_v \exp[\frac{-(\mu - E_v)}{k_B T}]$ (10 Marks)

Q2:- Assume that the Fermi energy level for a particular material is 6.25eV, and that the electrons in this material follow the Fermi-Dirac distribution function. Calculate the temperature at which there is a 1 percent probability that a state 0.30eV below the Fermi energy level will not contain an electron. (10 Marks)

Q3: Explain the origins of energy levels and energy band in solid material. (10 Marks)

Q4:- Calculate the intrinsic carrier concentration in gallium arsenide at T = 300 K and at T = 450 K, where values N_c and N_v at T = 300 K for gallium arsenide $4.7 \times 10^{17} cm^{-3}$ and $7.0 \times 10^{18} cm^{-3}$,respectively. Assume the band gap energy of gallium arsenide is 1.42eV and does not vary with temperature over this range. (10 Marks)

Q5:- Answer the following: (10 Marks)

(a)- What are the difference between Metals, Insulators and Semiconductors.

(b)- Drive an equation to calculate the electric conductivity coefficient.

Q6: What happens if we introduce a group **III** element, such as boron, as a substitution impurity to silicon. (10 Marks)

Not:- $N_A = 6.02 \times 10^{23} atom/mol$, $k_B = 1.3806 \times 10^{-23} J/K$, $1eV = 1.602 \times 10^{-19} J$

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Subject: Mathematics IV
Stage: Second

Date: 6 / 7 /2024
Time : 3 hours

((Final exam for the second semester))

2023 -2024

45

Q1. (a) Show that the equation $(y-C)^2 = Cx$,is a general solution of the differential equation $4x(\frac{dy}{dx})^2 + 2x\frac{dy}{dx} - y = 0$ and find particular solution satisfied by $x = 1, y = 2$. **(10 Mark)**

Q2. Obtain the differential equation associated with the following equations. **(12 Marks)**

(a). $y = C_1 e^{2x} + C_2 e^x + C_3$ (b). $y = C_1 3\cos 3x + C_2 3\sin 3x$

Q3. Determined the type of the following differential equations. **(6 Mark)**

(1) . $(4x^3y^3 - 2xy)dx + (3x^4y^2 - x^2)dy = 0$, (2). $(1 + 2e^{x/y})dx + 2e^{x/y}(1 - \frac{x}{y})dy = 0$

Q4. Find the integral factor of the following differential equations and solve each equation.

(1). $\frac{dy}{dx} + \frac{y}{x} = x^2y^3$ (2). $x\frac{dy}{dx} - 3y = x^2$ **(12 Marks)**

Q5. Solve the following differential equations. (1). $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$, (2) $y\frac{d^2y}{dx^2} = 4 + (\frac{dy}{dx})^2$

(12 Marks)

Q6. **By using homogeneous method solve the following differential equation.** **(8 Mark)**

$$(2x + 3y)dx + (y - x)dy = 0$$

Best of luck

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Subject: Rings theory II
Stage: third stage
Date: 5/7/2024
Time: 3 hours

05 JUL 2024

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

45

Academic year 2023-2024

Note: Answer all question.

Q1/ Answer the following: **(15 Mark)**

1) Define: 1- Monic polynomial 2- Noetherian 3- The Module

2) In the polynomial of the ring $(Z_{15}, +_{15}, \cdot_{15})$, let $f(x) = 3 + 4x + 2x^2$, $g(x) = 5 + 4x + 2x^2 + 3x^3$; find $f(x) + g(x)$ and $f(x).g(x)$?

3) Let $f(x) = x^4 - 3x^3 + 2x^2 + 4x - 1$ and $g(x) = x^2 - 2x + 5$, find $q(x)$ and $r(x)$ in $Z_6[x]$ such that $f(x) = g(x)q(x) + r(x)$.

Q2/Answer the following: **(15 Mark)**

Prove that, Let $f(x) \in F[x]$, and $f(x)$ is of degree 2 or 3 then $f(x)$ is reducible in F if only if it has a root in F.

rove that, if $(R, +, \cdot)$ is an integral domain then $(R[x], +, .)$ is an integral domain.

nswer the following: **(15 Mark)**

e that, let $(R, +, \cdot)$ be a commutative ring with identity if $f(x) \in R[x]$ and $a \in R$ $x) \in R[x]$, such that $f(x) = (x - a)q(x) + f(a)$.

hat, if $(R, +, \cdot)$ is a ring satisfies the A.C.C. on ideals then every non-empty collection of ideals has maximal element.

Q4/ Answer the following: **(15 Mark)**

1) Prove that, if $(R, +, \cdot)$ is Artinian ring and let $(I, +, \cdot)$ be an ideal of $(R, +, \cdot)$, then R/I is Artinian ring.

2) If $\{N_\alpha\}, \alpha \in \Lambda$ be a family of submodules of an R-Module M, then $\bigcap_{\alpha \in \Lambda} N_\alpha$ is also submodules.

Best of luck

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Subject: Approximation Theory
Stage: Fourth Stage
Date: 7 / 7 /2024
Time: 3 Hours

04 JUL 2024

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

45

Academic year 2023 -2024

Q1/ A- State and prove some properties of the Fourier series? (only Three)

B- Define and given an example Best Approximation. Then, find the graph.

-----(18 Marks)

Q2/ State and prove Korovkin type theorem.

-----(15 Marks)

Q3/ Prove that:

Let $A = (a_{jn})$ be nonnegative regular summability matrix, and let Υ_j be a sequence of positive linear operators from $G_s/\{I_e\}$ into $G_s/\{I_e\}$. Then for all $s \in G_s/\{I_e\}$ we have

$st - \lim_j \sum_{n=1}^{\infty} a_{jn} \|\Upsilon_j(G_s,.) - G_s\| = 0,$

if and only if

$sos_o = 1, \ni \quad s_o \in G_{s_o}$,

$G_s(so\tau) = \tau^{\lambda}s, \ni \quad \tau \in G_{s_1}$,

$G_s(sov) = so\gamma_{\tau-1}, \ni \quad v \in G_{s_2}$,

such that

$st - \lim_j \sum_{n=1}^{\infty} a_{jn} \|\Upsilon_j(G_{si},.) - G_{si}\| = 0, \quad i = 0,1,2$,

and G_{si} is a subgroup from G_s ; $i = 0,1,2$.

-----(15 Marks)

Q4/ A- Show that the relation (if exists) between B_n and M_n?

B- Evaluate a recurrence relation for the function $\phi_{n,2}(x) = \sum_{k=0}^{n} K^2 b_{n,k}(x)$.

-----(12 Marks)

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Subject :partial differential equations I I
Stage :third stage
Date: 4/7/2024
Time :3 hours

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

04 JUL 2024
45

Academic year 2023 -2024

Q1\\ An elastic string of length 2 cm has its end x=0 and x = 2 fixed its initially deflection looks like a parabola with vertex at the point (1,1) . it is set in motion with initial velocity equal x find the displacement end function $u(1,2)$ for all t .

*** (10 mark)

Q2\\ Drive the general solution of Heat equation

$$U_t = \propto^2 \ U_{xx} \ , \ 0 < x < 1 , 0 < t < \infty$$

*** (10 mark)

Q3\\ Find the solution of the heat problem $U_t = 100\, U_{xx}$, $0 < x < 1 , 0 < t < \infty$
$u(0,t) = 0 , u_t(1,t) = 0 , u(x,0) = 50$, $0 \le x \le 1$

*** (10 mark)

Q4\\ Find the sine Fourier series of $f(x) = \cos x$ where $x \in [0 , \pi]$

*** (10 mark)

Q5\\ Find the Fourier series of $f(x) = x$ where $x \in [-\pi, \pi]$ then find :

1) The convergence on the interval $\in [-\pi, \pi]$
2) The convergence of $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$
3) The approximate value of x

*** (10 mark)

Q6\\ Find the solution of $U_{tt} = 4\, U_{xx}$, $0 < x < 5$ under the condition $u(0,t) = 0$
$u(5,t) = 0$, $u(x,0) = 1$, $u_t(x,t) = 0$

*** (10 mark)

05 JUL 2024

Best of luck

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Subject : Linear algebra II
Stage :Second stage
Date: 4 / 7 /2024
Time : 3 hours

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

04 JUL 2024
45

Academic year 2023 -2024

NOT : For each question(15) marks

Q1) Solve the following systems of equation by cramer's rule

$$2X + Y - Z = 1$$

$$X + 2Y + Z = 8$$

$$3X - Y - Z = -2$$

Q2) In $V_6(R)$ with standard inner product , if $U = (3,-2,-3,1,1,-1)$
V=(-1 ,0,0, 1 ,1 ,1) . Find

(1) Length of U and V .

(2) The angle between U and V .

(3) Verify Cauchy-Schwarz and triangle inequality .

Q3) Let $T: R^3 \to R^2$ be the liner transformation given by
$T(x, y, z) = (x + y - z, x - 2y + z)$. Find the matric of T with respect to order bases $\beta = \{(1,1,1), (1,0,1), (0,0,1)\}$ for R^3 and , $C = \{(1,1), (1,-1)\}$ for R^2 .

Q4) Find the eigenvalue and eigenvector of $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 2 & 3 \\ 3 & 3 & 20 \end{bmatrix}$.

Best of luck

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Subject: English Language I
Stage: First stage
Date: / /2024
Time:

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

45

Academic year 2023 -2024

Q4\\ Choice the correct sentence: - **(10 Marks)**

1-Mary's children are married.	Mary is children are married.
2-What's your daughter name?	What's your daughter's name?
3-We're at school now	We're in school now
4- Mike's car is a Mercedes	Mike car is a Mercedes
5- They don't live in England anymore.	They don't live in England anymore.

Q5\\Determine whether s is s , z or iz in the following :- **(10 Marks)**

gets up	buys	televisions	houses	lives
watches	works	computers	has	hamburgers

Best of luck

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Subject: Pascal Language
Stage: First
Date: [illegible] 2024
Time: Three hours

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

Academic year 2023-2024

Q1) Answer the following questions: (10 marks)

1. What is the different between *break statement* and *continue statement*
2. What is the correct way to write the condition $a \geq b \leq c$?
   a) ((a≥b) and (a≤c)) b) ((a≥b) and (b≤c))
   c) ((a>=b) and (b<=c)) d) (a>=b>=c)
3. Which of the following is a valid identifier?
   a) 1_max b) _max_1
   c) max# d) max&min
4. If x is integer; what is the result of x := 31 / 4;
   a) 7.75 b) 7
   c) 8.75 d) Error: Type mismatch
5. Pascal Language supports object oriented programming.
   a) True b) False

Q2) Rewrite the following programs. (10 marks)

1- Use *repeat-until* instead of *for*	2- Use *case-statement* instead of *if-else*

Program a;
 	
Var
  i, j: integer;
 	
begin
 	
  for i := 1 to 5 do
    begin
      for j := 1 to 5 do
        begin
          write(i);
        end;
      writeln('');
    end;
 	
Readln;
End.
	Program a;
	
	Var
	  x: integer;
	
	begin
	
	Readln (x);
	if (x = 1) then
	  writeln('x = 1')
	else if (x = 2) then
	  writeln('x = 2')
	else
	  writeln('x is neither 1 nor 2');
	
	Readln;
	End.

Q3: Fill the following table based on the relational and logical operators: (4 marks)

P	Q	P & Q	P | Q	~P	~Q
0	0				
0	1				
1	1				
1	0				

مع التوفيق

Ministry of Higher Education
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Al-Muthanna University
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Department of Mathematics
and computer applications

Subject : Advance calculus II
Stage : Second stage
Date: 3 / 7 /2024
Time : 3 hours

03 JUL 2024

45

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

Academic year 2023 -2024

Q1\\ A- Find the area enclosed by the lemniscate $r^2 = 5\cos 4\theta$

B-Find the number of terms that you need to approximate $f(x)=ln(x)$ with 10^{-10}

(12 Marks)

Q2\\ A- Discuss the convergent or divergent of $\sum_{n=1}^{\infty} \frac{1}{n}$, use integral test.

B- Test the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{2^n}$

(12 Marks)

Q3\\ Find the values of first five terms of each of the following sequence

1- $\left\{\frac{1-n}{n^2}\right\}$ 2- $\left\{\frac{(-1)^n}{2n-1}\right\}$ 3- $\{2n\ln(n)\}$

(12 Marks)

Q4\\A-Find the Taylor series for $f(x)=\cosh x$ about $x_o=0$.

B- Discuss the convergent for $\sum_{n=0}^{\infty} \frac{10^n (x-1)^n}{n!}$

(12 Marks)

Q5\\ Find the interval and the radius for

1- $\sum_{n=1}^{\infty} \frac{x^n}{4^n n}$ 2- $\sum_{n=1}^{\infty} \frac{10^n}{n!}(n-1)^n$

(12 Marks)

Best of luck

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application

Subject: complex analysisII
Stage: 4th

Date: 3 / 7 /2024
Time : 3 H

03 JUL 2024

45

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

Academic year 2023 -2024

Q1/ choose with explanation (12 marks)

1) the series $\sum_{n=0}^{\infty} \frac{(1+i)^n}{2^n}$ is

a) the sum is three b) divergent c) the sum is one d) convergent

2) the series $f(z)=\sum_{n=0}^{\infty} \frac{f^{(n)}(z_0)}{n!}(z-z_0)^n$, $a_n \neq 0$ is called

a) Taylor series b) Laurent series c)geometric series d) Maclaurien series

3)in series $\sum_{n=1}^{\infty} \frac{(n+i)^{n^2}}{n^{n^2}}(z-1)^n$ the value of R is

a) $-e$ b) e c) $1/e$ d) 2e

4)the $\operatorname{Res}(\frac{\sin z}{z^2},0)$ is equal to

a) -6 b) -1/6 c) 1 d) 0

Q2/ choose with explanation (12 marks)

1)the Taylor series of the function $f(z)=\ln(z)$ at $z=12$ is equal to

a) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(z-1)^{n-1}}{n}$ b) $\sum_{n=0}^{\infty} z^n/n$ c) $\sum_{n=0}^{\infty} \frac{(-1)^{n-1}(z-1)^{n-1}}{n}$ d) $\sum_{n=1}^{\infty} z^n/n$

2) the residue of the function $f(z)=\frac{2z}{(z+4)(z-1)^2}$ is equal to

a) $4\pi i$ b) 3/16 c) 3i/16 d) 12i/16

3) By using residues the value of the integral $\int_{|z|=1} \frac{\cosh z}{z^3}dz$ is

a) $-\pi i$ b) $2\pi i$ c) $3i\pi$ d) $6\pi i/7$

4) the Talyor series of the function $f(z)=\frac{1}{(1-z)}$ is

a) $\sum_{n=0}^{\infty} z^n$ b) $\sum_{n=0}^{\infty} (z^n/n!)$ c) $\sum_{n=0}^{\infty} (1/n!)$ d) $\sum_{n=0}^{\infty} (nz/n!)$

Q3) State and prove Roushe Theorem? (12 marks)

Q4) Defined the meromorphic function and if $f(z)=\frac{(z-8)^2 z^3}{(z-5)^4(z+2)^2(z-1)^2}$, fined the $N_p(f), N_0(f)$? (12 marks)

Q5) Find $\int_0^{\infty} \frac{2x+1}{(x^2+4)(x^2+9)}dx$? (12 marks)

Good Luck

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Subject: Mathematical Analysis II
Stage: Third Stage
Date: 8/7/2024
Time: 3 Hours

08 JUL 2024

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

45

Academic year 2023 -2024

Q1/ Prove that:

A- Let (X,d) and (Y,d^*) be a metric spaces, and let $f: X \to Y$ be a function. Then, the following equivalents:

1) $f(\bar{A}) = \overline{f(A)}$, for $A \subseteq X$.

2) $\overline{f^{-1}(B)} \subseteq f^{-1}(\bar{B})$, for $B \subseteq X$.

B- In a metric space, any finite set is compact.

(20 Marks)

Q2/ Find of the following:

1- If $(\mathbb{R}, d)$ is an U.M.S., and $F = \left\{A_n = \left(\frac{1}{n}, 2\right) : n \in \mathbb{Z}^+\right\}$. Is F open cover to $E = (0,1)$?

2- Find Riemann integral of the function $f: [0,2] \to \mathbb{R}$, $f(x) = 3x$ and $x \in [0,2]$.

(14 Marks)

Q3/ State and prove of the following theorems:

i) Inverse function theorem.

ii) Rolle's theorem.

(16 Marks)

Q4/ Discuss of the following statements:

Uniform continuous and continuous.

Riemann integrable and Lebesgue integrable.

(10 Marks)

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