University of Technology
Department of Applied Sciences
Final Examination 2016/2017

Subject : Abstract Algebra
Year: 3rd
Branch: Mathematics and Computer Applications
Time : 3 hours
Examiner : Dr. Anwar Khaleel
Date : 29- 5 -2017

Answer only five (5)Questions

ملاحظة: الاجابة عن خمس أسئلة فقط ولكل سؤال 14 درجة.

Q_1: (A) Let $R = (Z_{12}, +_{12}, \cdot_{12})$.

1. Find all maximal ideals of R. 2. Evaluate $char.(R)$. 3. Is R a field? Why?

(B) Let G be a set of all real numbers except 0. Define $*$ on G by $a * b = |a|b$, where $|a|$ is the absolute value of a. Is $(G,*)$ a group?

Q_2: (A) State only: Krull-Zorn theorem, Lagrange theorem.

(B) Prove that: 1. Every Boolean ring is commutative.

2. Every field is integral domain.

Q_3: (A) Prove that

1. There is no simple group of order 200. 2. Every group of index 2 is normal.

(B) Define the integral domain ring. Is the product of integral domain rings also an integral domain?

Q4: (A) Prove or disprove each of the following

1. Every prime ideal is maximal. 2. Every subring is ideal.
3. The cancellation law for multiplication holds in any ring.

(B) Define the following: Cyclic group, P-Group, Normal group, Skew field.

Q_5: (A) Let R be a ring with identity. Define $g: Z \to Z$ by $g(x) = x.1, \forall x \in Z$. Is g a homorphism? What's $ker(g)$?

(B) Define the triangle group. Then 1. Find all subgroups of it.

2. Is it abelian? Why?

Q_6: (A) Let G be a group which has order $2p$, where p is prime number. Prove that every proper subgroup of G is cyclic.

(B) Let I be a maximal proper ideal of commutative ring with identity R. Prove that R/I is a field.

University of Technology
Department of Applied Sciences
Final Examination
2017 -2016

Subject : Programing (Matlab)
Branch :Appl-Math
Examiner: A.M Shukur

Class : third class
Time : 3 hours
Date : 31/ 5 /2017

Note: Answer only five questions, (10 mark for each one)

Q1)what is the output (result) of the following sets of commands:

>> x = 5;
>>while x < 25
>>disp(x)
>>x = 2*x - 1;
>>end
	>>A=[[1 2 3]'[3 2 1]'...
	[2 1 3]']; B=A;
	for j=2:3; for i=j:3,
	B(i,:) = B(i,:) – B(j-1,:)
	... *B(i,j-1)/B(j-1,j-1);
	end ; end
		>> x = 1; y = 2;
		while y < 5;
		z(x) = 2 .* y;
		x = x + 1;
		y = y + 2;
		end
			>>JJ=0;
			for II=1:2:5
			JJ=JJ+1;
			End
				>> syms n r ;
				>> diff(r*sin(n), n,2)

Q2)A- write m-file which asks user to enter n^{th}- real numbers, then it tells the user (after each number) if this number odd or even?

B)-write m-file to help user to enter three numbers and it will rewrites these numbers from Smallest one to largest one? Tell the user about the working of this m-file? Don't use sort?

Q3) by using true (T) or false (F) marks , answer the following questions:

a) Using (clc) to clean C.W without memory and (clear) to clean memory only.
b) (Whos) to List current variables but (who) lists the variables in the current workspace.
c) (save test.mat). to save all variables from the C.W to file (test.mat).
d) load('hand.mat', 'y') to load all variables which is starting by y, from file hand to C.W.
e) The matrices that have two dimensions, must be square or rectangle form only.

Q4) write m-file to sort data into odd and even, it will do the following:

1- It asks user to choose positive real number n, which is the number of user's data.
2- It gives to user time to enter the data one by one.
3- It will test the enter-data as the following.
4- If data is zero the user will read n must be positive and he gets other chance.

x will save even data and y will be zero or y will save odd and x will be zero?

Q5) Find the result of Z at the last command for the following groups:

Group 1	Group 2	Group3	Group 4	Group 5
X = [1 3 5 7 9]; Y= [2 4 6 8 10]; >> Z=X*Y	X= [1 3 5 7 9] ; Y=[2:4:6:8:10] ; >> Z=X*Y	X= diag(eye(3)).*3; K=ones(3)+eye(3); >>Z= diag(X)+K	X= zeros (3); X=X+diag(1:3); >> Z= X(3,1:3)	X=linspace(1,5,5); Y=(1:5); >> Z = X.*Y

Q6)A- write commands on C.W to do the following :

1- enter the two polynomials ; $P1=2X^3 -3X^2 + 4X -6$; $P2= 4X^4 – 2X + 5$,
2- to Calculate Z=P2/P1 ; 3- to find P1(2) ; 4- to find zeroes of P2 ; 5- to find P1P2?

B- write the Matlab commands which is equivalent with each mathematical expression:

$y = \int_a^b f(x)dx$; $f(x)=2x^2+\cos^{-1}(x)+e^x$	$y'' + 4y' + 3y=3e^{-2t}$ $y'(0)= -1$; $y(0) =1$ Find solution y(t)	9A+5B=0 2A-6B=0 Find A and B	X=1; X=2; X=3 Find $P_3(X)$	$P_4(x)=x^4-2x^2+3x$ Find $P'(x)$.

Good luck

University of Technology
Department of Applied Sciences
Final Examination
2016 -2017

Subject: Mathematical Analysis *Class: Third year*
Branch: Mathematics & Computer Applications *Time:* 3 hours
Examiner: Dr. Jabbar Abbas *Date:*

Note: Answer **only five** of the following questions.

Q1:
Define and give example on each of the following
a) limit point **b)** Open cover **c)** Desired set **d)** Uniformly continuous.

Q2:
Prove or disprove the following
a) $A \cap B$ is compact set, whenever A is closed set and B is compact set.
b) If f is continuous function at a point then f is differentiable at the same point.

Q3:
a) If $d((x_1, x_2, x_3), (y_1, y_2, y_3)) = Max(|x_1 - y_1|, |x_2 - y_2|, |x_3 - y_3|)$.
Determine whether (R^3, d) is metric space or not.
b) Prove that, the set $\left\{-1, \ -1 + \frac{1}{n}\right\}_{n=1}^{\infty}$ is compact in R.

Q4:
a) Give example on monotonic sequence and prove that, whenever $\{a_n\}$ is monotonic sequence, then $\{a_n\}$ converges if its bounded.
b) Define Cauchy sequence and prove that, every convergent sequence is Cauchy sequence.

Q5:
a) Show that, if $\sum_{k=1}^{\infty} a_k$ is convergent series then
i) For every $\epsilon > 0$, $\exists\ N_\epsilon$ such that $|\sum_{k=n}^{m} a_k| < \epsilon$.
ii) $\lim\limits_{k \to \infty} a_k = 0$.
b) Suppose X, Y, and Z are metric spaces, $E \subset X$ and $f(E) \subset Y$. If $f : E \to Y$ is continuous at a point $p \in E$ and if $g : f(E) \to Z$ is continuous at $f(p)$, then, the mapping of E into Z defined by $h = g \circ f$ is continuous at p.

Q6:

Suppose f is continuous on $[a,\ b]$, $f'(x)$ exists at some point $x \in (a,\ b)$, g is defined on I which contains the range of f, and g is differentiable at $f(x)$. Then $h(t) = g(f(t))$, $a \le t \le b$ is differentiable at x, and $h'(x) = g'(f(x))\ f'(x)$.

......................................Good Luck..............................

University of Technology
Department of Applied Sciences
Final Examination 2016/2017

Subject: Operation Research **Class: 3**
Branch: mathematic and applied sciences **Time:3 hours**
Examiner: *I. Fatema Ahmed* **Date:** 6/6/2017

Note : Answer 4 questions, (17.5)for each question.

Q1/ Using B-M method to find the optimal solution of the following problem:

Min $Z=x_1-2x_2$

Sub.to $4x_1+2x_2 \leq 6$

$2x_1-3x_2 \geq 1$

$x_1 , x_2 \geq 0$

Q2/ Consider problem:

Max $Z=9x_1+14x_2+6x_3$

sub.to $x_1+x_2+x_3 \leq 9$

$4x_1-3x_2+5x_3=4$

$x_1,x_2,x_3 \geq 0$

	X1	X2	X3	S1	R2	*R.H.S*
Max Z	0	0	16/7	83/7	-5/7+M	727/7
X2	0	1	-1/7	4/7	-1/7	32/7
X1	1	0	8/7	3/7	1/7	31/7

The optimal solution of this problem is:

If we change the right hand side from $\begin{pmatrix} 9 \\ 4 \end{pmatrix} to \begin{pmatrix} 1 \\ 6 \end{pmatrix}$ .Check whether the current optimal solution effect or not? If so, find the new solution (stop at 2 tables)

Q3/a) Write the dual of the following L.p.p :

1) Max $Z=5x_1+6x_2$

Sub.to $x_1+2x_2=6$

$-x_1+5x_2 \geq 3$

x_1 unrestricted $,x_2 \geq 0$

2) Max $Z=x_1+x_2$

Sub.to $x_1+x_2=5$

$3x_1-x_2 =6$

$x_1,x_2 \geq 0$

b) Using graphical method to find the feasible region and the optimal solution of the following:

Min $Z= 2x_1+5x_2$

Sub. To $2x_1+4x_2 \geq 8$

$-3x_1+ x_2 \leq 9$

$8x_1+2x_2 \leq 24$

$x_2 \leq 4$

$x_1,x_2 \geq 0$

Q4) A project consists of (6) activities and completion time are given below

i) Draw the project Network.

ii) Find the critical path analysis.

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activity	Immediate predecessor	Completion time
A	________	3
B	A	8
C	________	7
D	________	12
E	B,D	10
F	C,E	20

Q5) Using graphical method to solve the following matrix game

	B1	B2	B3
A1	1	3	12
A2	8	6	2

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Department of Applied Sciences

Final Examination 2016/2017

Subject: Graph theory — *Year: Third*
Branch: Mathematics & Computer Applications — *Time : 3 hours*
Examiner : Dr. Manal Najy — *Date : 2017- -*

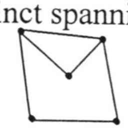
Answer five Questions(each question has 14 marks)

Q1:(a) If G is a maximal plane graph with $n \geq 3$, then prove that $m \leq 3n - 6$.

(b) If G is a graph in which the degree of each vertex is at least 2, then prove that G contains a cycle.

Q2: (a) If G is a plane connected graph, then prove that G^{**} is isomorphic to G.

(b) Find the number of distinct spanning trees of G and draw all of them, where G is illustrate in following Figure



Q3: (a) Prove that every nontrivial tree has at least two end-vertices.

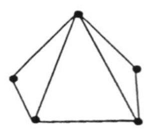
(b) If G is a simple graph with largest vertex-degree Δ, then prove that G *is* $(\Delta + 1)$-colourable.

Q4: (a) Prove that a map G is 2-colourable (f) if and only if G is an Eulerian graph.

(b) For which values of n the wheel W_n is Hamiltonian? and For which values of n the $K_{n,n}$ is Eulerian?

Q5: (a) Find $G_1[G_2]$ and $G_1 \times G_2$ where $G_1 = P_2$ and $G_2 = P_3$.

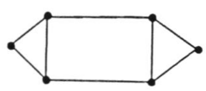
(b) Find the chromatic polynomial of G



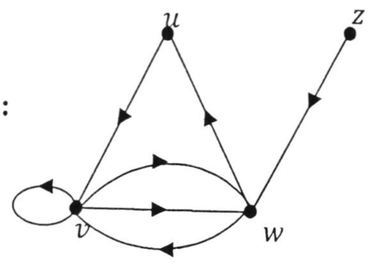
G

Q6:(a) Let G be a simple graph on n vertices. If G has k components, then prove that the number m of edges of G satisfies $n - k \leq m \leq (n - k)(n - k + 1/2)$

(b)(i) Can the graph G be orientable ? G:



(ii) Is D a strongly connected graph? D:



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University of Technology
Department of Applied Sciences
Second Course Examination
2016 -2017

Subject:Numerical Analysis	*Class: 3rd year*
Branch:Mathematic	*Time: 3 hours*
Examiner: Hayat.A.Ali	*Date:*

(Choose five questions)

Q1) Compute the value $y(\frac{9\pi}{8})$ using Runge- Kutta second order method where

$\frac{d^3y}{dx^3} + y' = 0 \quad y(\pi) = 0,\ y'(\pi) = 2,\ y''(\pi) = -1 \quad h = \frac{\pi}{8}$ (10M)

Q2) Determine the general solution for the difference equation (10M)

$z_{k+2} - 2z_{k+1} + z_k = \text{sink} - 2cosk$

Q3) (10M)

(a) Complete the sentence with the right words

(1) The partial differential equation classified into hyperbolic P.D.E when---------.

(2) A residual is the equation obtained by substituting the ----------- into the differential equation.

(3) If we use central difference approximation to convert the partial differential quantity thus $\frac{\partial^2 u}{\partial x^2} =$ ----------------.

(4) A five point formula has the form ---------------.

(5) Normalization is used to transform any interval into -------- interval .

(b) Find the largest eigen value and the eigen vector for the matrix $A = \begin{bmatrix} 2 & 0 \\ 1 & 11 \end{bmatrix}$ where $x^T(0) = (1 \quad 1)^T$

Q4) Solve the boundary value problem $y'' - 3y' + 2y = 0$ with

$y'(1) = 1 \ , \quad y(3) = 2e^4 - e^2 \qquad h = 0.5$

Q5) Find u such that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \quad with \ \ u(x,0) = 0.5x^2,\ \ u(x,10) = 0,\ \ u(0,y) = 0,$

$u(20,y) = 1 \quad where \ \ h = k = 5$

Q6) Find the approximate value of A and B in $y_a = x(1-x)(A + Bx) \quad where \ \ y'' + x^2 = 0$

and $y(0) = y(1) = 0$ by using

(a) Least square method

(b) Galerkin's method