WS 2019-20

Digital Assignment 1

Course: MAT1014 (DMGT)

Answer all the questions

Guidelines for Submission:

- Download the questions. Write your answers in A4 size sheet neatly, in detail **without any corrections**. Draw the borders for each page.
- Write your **name** and do the **signature** on the top of every page
- Take the snap shot of your filled-in answer sheet carefully which should be clearly visible, and make a **single pdf** file only.
- Then upload it through the student log-in portal. Uploading of answers in any other format is not acceptable.
- Do not send different **image files** or zipped files. **Do not send** the answer sheet to **my mail address**
- The portal will not receive the files after the due date, and the marks awarded will be automatically zero for those who do not submit in time. Do not postpone your task until the last date of submission. **Please note it**
- **Do not forget to submit the hard copy** in person
- **Follow the guidelines strictly. Any deviation from the above instructions will lead to the reduction in marks**

Questions:

1	a) Obtain the pdnf and pcnf of the following formula and hence conclude whether it is a tautology $(P \to (Q \wedge R)) \wedge (\neg P \to (\neg Q \wedge \neg R))$ b) Test the consistency of the following Statements. i. If Jack studies well he will pass in exams. ii. If Jack studies well he will get a job. iii. Succeeding in exam and getting a job simultaneously are not possible for him. iv. Jack either enjoys or studies well. v. Finally, Jack enjoys.

2	a) If *A* works hard, then either *B* or *C* will enjoy themselves. If *B* enjoys himself, then *A* will not work hard. If *D* enjoys himself, then *C* will not. Therefore, if *A* works hard, then *D* will not enjoy himself. Show that the above statements constitute a valid argument by using the Rule CP. b) Obtain the PCNF of the statement $S:(P\wedge Q)\vee(\neg P\wedge R)$. Using this obtain the PCNF of $\neg S$ and hence the PDNF of S. Also determine the unique representation of the PCNF and PDNF.
3	a) Obtain the principal conjunctive normal form of the formula S given by $(\sim P\rightarrow R)\wedge(Q\leftrightarrow P)$ and hence obtain Principal disjunctive normal form of S. b) Show that the following sets of premises are inconsistent (i) $A\rightarrow(B\rightarrow C), D\rightarrow(B\wedge\sim C), A\wedge D$. (ii) $P\rightarrow Q, P\rightarrow R, Q\rightarrow\sim R, P$
4	Show that the conclusion $\forall x(P(x)\rightarrow \urcorner Q(x))$ follows from the premises $\exists x\,(P(x)\wedge Q(x))\rightarrow \forall y\,(R(y)\rightarrow S(y))$ and $\exists y\,(R(y)\wedge \urcorner S(y))$. b) Show that $(\forall x)(P(x)\vee Q(x))\Rightarrow((\forall x)P(x))\vee((\exists x)Q(x))$ by using the indirect method of proof.
5	a) Show that if every element in a group is its own inverse, then the group must be abelian. b) Show that the set of all the invertible elements of a monoid form a group under the same operation as that of the monoid. c) Let $(S,*)$ be a given semigroup. Prove that there exists a homomorphism $f:S\longrightarrow S^S$, where $(S^S,\circ)$ is a semi group of functions from S to S under left composition.