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**MT131: Discrete Mathematics**

**Tutor Marked Assignment**

Cut-Off Date: April--, 2022 Total Marks: 40

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I hereby declare that this submitted TMA work is a result of my own efforts and I have not plagiarized any other person's work. I have provided all references of information that I have used and quoted in my TMA work.

**Student Name : Mohamad Baker Obeid**

**Signature : Mohamad Baker Obeid**

**Date : 05 – Mar – 2022**

**MT131 TMA Feedback Form**

**[A] Student Component**

**Student Name : Mohamad Baker Obeid**

**Student Number : 220589**

**Group Number : \_\_\_\_\_\_\_**

**[B] Tutor Component**

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|  | **Comments** | **Weight** | **Mark** |
| **Q\_1** |  | **8** |  |
| **Q\_2** |  | **8** |  |
| **Q\_3** |  | **8** |  |
| **Q\_4** |  | **8** |  |
| **Q\_5** |  | **8** |  |
|  |  | **40** |  |

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| **General Comments:** | | | |
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|  | **Tutor name:** |  |  |

**The TMA covers only chapters 1, 2, 4, 6 and 7 and consists of eight questions for a total of 40 marks. Please solve each question in the space provided. You should give the details of your solutions and not just the final results.**

**Q−1:[8×1 marks]**Let and be the propositions:

: “Ahmad comes to the party”,

: “Salim comes to the party”,

: “Khalid comes to the party”,

: “Bader comes to the party”.

Write the following propositions using and logical connectives:

1. “Nether Ahmad nor Salim come to the party”. ¬P˄¬Q
2. “If Bader comes to the party, then Salim and Khalid come too”. S → (Q˄R)
3. “Khalid comes to the party only if Ahmad and Salim do not come”.

(¬P˄¬Q) → R

1. “Bader comes to the party if and only if Khalid comes and Ahmad doesn’t come”.

(R˄¬P) → S

1. “If Bader comes to the party, then, if Khaliddoesn’t come then Ahmad comes”.

(S˄¬R) → P

1. “Khalid comes to the party provided that Bader doesn’t come, but, if Bader comes, then Salim doesn’t come”.

(¬S → R) ˄ (S → ¬Q)

1. “A necessary condition for Ahmad coming to the party is that, if Salim and Khalid aren’t coming, Bader comes”.

¬Q ˄ ¬R → (P ˄ S)

1. “Ahmad, Salim and Khalid come to the party if and only if Bader doesn’t come, but, if neither Ahmad nor Salim come, then Bader comes only if Khalid comes”.

( ¬S → (P ˄ Q ˄ R) ) ˄ ( (¬P ˄ ¬Q ˄ R) → S )

**Q­−2:**

1. **[2+2 marks]** Let. In each of the following cases, find and determine whether , both or neither:
2. .
3. .
4. **[2+2 marks]** Which of the following functions, whose domain and codomain are the real numbers, are one-to-one, which are onto, and which have inverses, justify your answers:
5. .
6. .

**Q­−3:[2+3+3 marks]**

1. Find all such that.
2. If is a zero-one matrix, find.
3. Find the inverse of the encrypting function

,

and use it to decrypt the message “ZRQUBFNB”.

**Q­−4:**

1. **[1+1+2 marks]** Consider the design of a communication system.
   1. How many three-digit phone prefixes that are used to represent a particular geographic area (such as an area code) can be created from the digits 0 through 9?
   2. As in part **i.**, how many three-digit phone prefixes are possible that do not start with 0 or 1, but contain 0 or 1 as the middle digit?
   3. How many three-digit phone prefixes are possible in which no digit appears more than once in each prefix?
2. **[1+1+2 marks]** Suppose that an operating room needs to handle three knee, four hip, and five shoulder surgeries.
   1. How many different sequences are possible?
   2. How many different sequences have all hip, knee, and shoulder surgeries scheduled consecutively?
   3. How many different schedules begin and end with a knee surgery?

**Q­−5:**

* + 1. **[2+1+1 marks]** An urn contains 5 red balls and 6 blue balls. A ball is drawn randomly, its colour is noted, and then the ball is replaced in the urn. If this process is repeated four times:

1. What is the probability of getting two red balls and 2 blue balls?
2. What is the probability that all 4 balls are of the same colour?
3. What is the probability that the first red ball is drawn in the 4th trial?
   * 1. **[2+1+1 marks]** Number plates in an Arab country consist of 3 letters (chosen from a specified set of 20 letters from the Arabic alphabet) and 4 digits (from 0 to 9).
4. Find the probability of a plate having identical letters.
5. Find the probability of a plate having identical digits.
6. Find the probability of a plate having consecutive digits.