

Birla Institute of Technology and Science Pilani

Second Semester 2021-2022

Comprehensive Examination

CE G573: Road Safety & Accident Analysis

Max. Duration: 180 min.

Max. Marks: 80

- 1) Discuss briefly the zero inflated Poisson regression? Why do we need such modeling techniques? [10]
- 2) Write a short note on Discrete Outcome Model. [10]
- 3) What is overdispersion and how can one measure it? [05]
- 4) Number of accidents per year since Year 2015, 2016, 2017, 2018, and 2019 are 5, 3, 6, 2, 1, respectively at an intersection of a city. The traffic speed at the intersection during Year 2015, 2016, and 2017 was recorded as 35 km/h, 30 km/h, and 35 km/h, respectively. In the beginning of Year 2018, a rigorous discussion on the safety issues of this intersection took over, and over speeding was concluded to be the single most cause of accidents. Then, a speed limit of 15 km/h at the intersection was posted, and later on a traffic police was also stationed at the intersection for enforcing this law. It is considered that accident count per year at the intersection follows Poisson distribution. Policymakers are asking that what is the probability of one accident per year at the intersection if the traffic speed is further reduced to 10 km/h? What will be your answer to the policymaker? [30]
- 5) Find out the root/roots of the following function using Newton-Raphson method. (Guide: use 0 as your first guess and carry out three iterations) [15]

$$f(x) = x^3 - 5x + 1$$

6) 12 data points with the following structure are stored in a file namely, Example-1.dat.

```
7    1    2    4
3    4    3    2
6    5    2    8
```

What will be the output of the following commands in R?

[05]

```
> X <- scan("Example-1.dat")
> A <- matrix(X, ncol = 3, byrow=TRUE)
> A
```

7) 9 data points with the following structure are stored in a file namely, Example-2.dat.

```
4    2    1    1    3    2
      2    4    7
```

Further, 3 data points with the following structure are stored in a file namely, Example-3.dat.

```
5    3    4
```

What will be the output of the following commands in R?

[05]

```
> X <- scan("Example-2.dat")
> A <- matrix(X, ncol = 3, byrow=TRUE)
> b <- scan("Example-3.dat")
> B <- matrix(b, ncol=1, byrow=TRUE)
> A %*% B
```