Dr. Aloh Kengy

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT TEST -3 EXAMINATION- 2021

## B.Tech VII Semester

COURSE CODE: 20B1WEC732

MAX. MARKS: 35

COURSE NAME: Machine Learning for Wireless Communications

COURSE CREDITS: 03

MAX. TIME: 2 Hours

**Note:** All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

- Q.1 What is MIMO? What are the advantages of MIMO antenna system in Communication System? How machine learning improve the performance of MIMO system in wireless communication?

  [CO3, CO4] [1+1+2=4 Marks]
- Q.2 Answer the following questions
- a) What is BER in wireless communication system?
- b) Derive the expression for BER (in terms of SNR) when bit 1 is transmitted in a wired communication system.
- c) Compute the value of SNR (in dB) required to achieve the BER of  $10^{-6}$  in wire-line communication system [CO2] [1+1+2=4 Marks]
- Q.3 What is cognitive cycle? How Cognitive Radio is useful in 5G communication system. Write any one application of machine learning in cognitive radio. [CO3, CO4] [1+1+2=4 Marks] Q.4 Find the value of  $\alpha$ ,  $\beta$  and  $\gamma$  to best fit the given sample data points on the system given by the equation  $y = \alpha x_1^{\beta} x_2^{\gamma}$ . Where  $x_1$ ,  $x_2$  and y are the SNR, Bandwidth and Throughput respectively

| SNR | Bandwidth | Throughput |
|-----|-----------|------------|
| 0.5 | 1         | 5          |
| 1   | 1         | 7          |
| 2   | 4         | 10         |

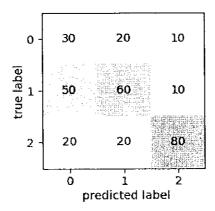
[CO1, CO4] [4 Marks]

Q.5 How Gradient descent algorithm is different with regression analysis? Find out the updated value of  $a_0$  and  $a_1$  after  $3^{rd}$  iteration for the given sample data points for the equation  $Y = a_0 + a_1 X$ . Where, X=SNR, and Y=Throughput. Consider initial guess  $a_0=0$  and  $a_1=0$ .

| SNR | Throughput |
|-----|------------|
| 0.5 | 1.2        |
| 2   | 2.4        |
| 3   | 3.5        |

[CO1, CO4] [4 Marks]

Q.6 Explain Accuracy and Precision. Find out accuracy and precision for the given confusion matrix. [CO1] [2+2=4 Marks]



Q.7 Differentiate between Mean and Mode. Where do we prefer to compute mean and where we prefer mode, explain with a suitable example.

[CO1] [1+1+1=3 Marks]

Q.8 Differentiate between Supervised, Unsupervised and Reinforcement Learning.

[CO1] [3 Marks]

Q.9 What is feature scaling? Why it is needed? How we can achieve it, explain it by considering suitable example? [CO1] [3 Marks]

Q.10 What are the requirements of good clustering?

[CO1] [2 Marks]