

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
SUPPLEMENTARY EXAMINATION- JULY 2017

M.Tech. (IV Semester)/ BTDD

COURSE CODE: 12M1WEC432

MAX. MARKS: 100

COURSE NAME: Fundamentals of MIMO Systems

COURSE CREDITS: 03

MAX. TIME: 2 Hrs

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

- Q1. a) Find the relationship between moment and characteristic function of a random variable. (5)
b) Show that diversity order in wired communication system is infinite. (5)
- Q2. a) Show that if X and Y are independent Gaussian random variables with zero mean and equal variance then $\sqrt{X^2 + Y^2}$ has Rayleigh distribution and $\tan^{-1}\left(\frac{Y}{X}\right)$ has uniform distribution in $(-\pi, \pi)$. (8)
b) What do you understand by SVD of a channel matrix H . (8)
- Q3. Discuss V-Blast decoder with an example. (10)
- Q4. Explain in what ways GSM, UMTS and LTE network architecture differ from each other. (10)
- Q5. Differentiate between: (15)
a) Narrowband and wideband wireless channel.
b) Delay spread and coherence bandwidth.
c) Matrix-inverse and pseudo-inverse of MIMO-channel matrix.
- Q6. What are MIMO-ZF and MIMO-MMSE receiver? Show that MIMO-MMSE receiver doesn't amplify noise as that of MIMO-ZF receiver. (10)
- Q7. How power allocation is performed using water filling algorithm? Show that water filling algorithm maximize the capacity of wireless channel. (10)
- Q8. What are problems in OFDM communication system? Explain. (10)
- Q9. Explain following: (9)
a) Loss in efficiency in OFDM
b) Bottleneck in multi-carrier communication system.
c) Alamouti code.