

## CS6015: Linear Algebra and Random Processes

### Quiz - 5

Course Instructor : Prashanth L.A.

Date : Oct-6, 2017 Duration : 30 minutes

Name of the student :

Roll No :

**INSTRUCTIONS:** For true/false questions, you do not have to justify the answer. For the rest, provide proper justification for the answers. Please use rough sheets for any calculations *if necessary*. Please **DO NOT** submit the rough sheets. **DO NOT** use pencil for writing the answers.

1. True or False? Answer any five. (2 + 2 + 2 + 2 + 2 marks)

*Note: 2 marks for the correct answer and -1 for the wrong answer.*

- (a) Union of two  $\sigma$ -fields is a  $\sigma$ -field.
- (b) Intersection of two  $\sigma$ -fields is a  $\sigma$ -field.
- (c) The probability that in a group of 25 people, at least two have same birthday is at least 0.5.
- (d) There exist events  $A, B$  such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{2}{3}$ , and  $P(A \cap B) = \frac{1}{12}$ .
- (e) Let  $P_1$  and  $P_2$  be two probability measures. For any event  $A$ , let

$$P(A) = \alpha_1 P_1(A) + \alpha_2 P_2(A), \text{ where } \alpha_1 + \alpha_2 = 1.$$

Then,  $P$  is also a probability measure.

- (f) Let  $B_1 \supseteq B_2 \supseteq B_3 \supseteq \dots$  be a decreasing set of events. Then,

$$P\left(\bigcap_{i=1}^{\infty} B_i\right) = \lim_{i \rightarrow \infty} P(B_i).$$

2. In a supermarket near IITM, each packet of Corn Flakes may be found a plastic bust of one of the last four chairmen of CSE - abbreviated as KS, PSK, CSRM and TAG. The probability that any given packet contains any specific Chairman's bust is  $\frac{1}{4}$ .

Suppose you rush to this supermarket and buy four packets of Corn flakes. Then, what is the probability that you get (3+4+3 marks)

- (a) at least one KS bust.
- (b) at least one KS bust and at least one PSK bust.
- (c) one of each four busts.