HS 224: Game Theory and Economics
BTech 4th Semester, Mid Semester Test
Total Marks 40, Time 120 minutes
Date: 3rd March, 2018
[*Answers should be accompanied by proper elaboration*]

1. (a) Differentiate between strict Nash equilibrium and non-strict Nash equilibrium (with examples). [5]
   (b) Differentiate between strictly dominated and weakly dominated actions (with examples). [5]
   (c) Define symmetric games with two players and symmetric Nash equilibria (with examples). [5]
   (d) What are rationalisable actions? Which actions (if any) are rationalisable in the following game? [2+3]

	x	*y*	*z*
a	1,2	0,1	1,3
b	0,1	0,0	1,0
c	$\frac{1}{2}$,2	1,0	2,1

2. [Interaction among resource-users] A group of n firms uses a common resource (a river or a forest, for example) to produce output. As more of the resource is used, any given firm can produce less output. Denote by x_i the amount of the resource used by firm i (= 1, . . . , n). Assume specifically that firm i's output is
   = $x_i (1 - (x_1 + \ldots + x_n))$ if $x_1 + \ldots + x_n \leq 1$, and
   = 0, otherwise. The total resource is normalized to 1 here.
   Each firm i chooses x_i to maximize its output.
   (a) Formulate this situation as a strategic game, find its Nash equilibria. [6]
   (b) Find an action profile $(x_1, \ldots, x_n)$ at which each firm's output is higher than it is at the Nash equilibrium. [4]

3. [Bertrand's duopoly game with discrete prices] Consider the variant of the example of Bertrand's duopoly game discussed in the class in which each firm is restricted to choose a price that is an integral number of rupees. Take the monetary unit to be a rupee, and assume that c is an integer and $\alpha > c + 1$. Is (c, c) a Nash equilibrium of this game? Is there any other Nash equilibrium? [6+4]