Q 1: (5 points) Deadline - 11:59 pm on August 21, 2017

(a) Model Peterson's Mutual Exclusion protocol in Promela and verify the mutual exclusion property using a never claim in Spin.

(b) Peterson's mutual exclusion protocol requires setting a boolean variable to true in a process and setting another variable to the identifier of another process to request for accessing the critical section. Modify the Promela model by changing the ordering of these two assignments in one of the processes and verify the Protocol using Spin again. From the generated counterexample trace, determine the error in the model of the propocol.

Q 2: (5 points) Deadline - 11:59 pm on August 28, 2017

Model the Alternating Bit Protocol in Promela. Through extensive simulation, ensure that the model is acceptable for verification.

Q 3: (5 points) Deadline - 11:59 pm on October 1, 2017

(a) Develop a Promela model for mutual exclusion protocol for two processes by means of an arbiter.

(b) Capture the "mutual exclusion" property as an LTL formula and verify the model with respect to this property.

(c) Capture the property "both the processes will enter the critical section infinitely often" and attempt to verify the model with respect to this liveness property. Show that the property cannot be verified.

(d) Identify appropriate fairness condition that will enable you to verify the liveness property. Combine the fairness condition with the previous liveness property and verify the model with respect to this property.

Q 4: (5 points) Deadline - 11:59 pm on October 8, 2017

Develop a Promela model for a semaphore based mutual exclusion protocol for two processes using a shared binary variable. Verify the model with respect to the mutual exclusion property both by keeping Partial order reduction switched on and switched off. Report on the number of states stored during the verification process in both the cases.