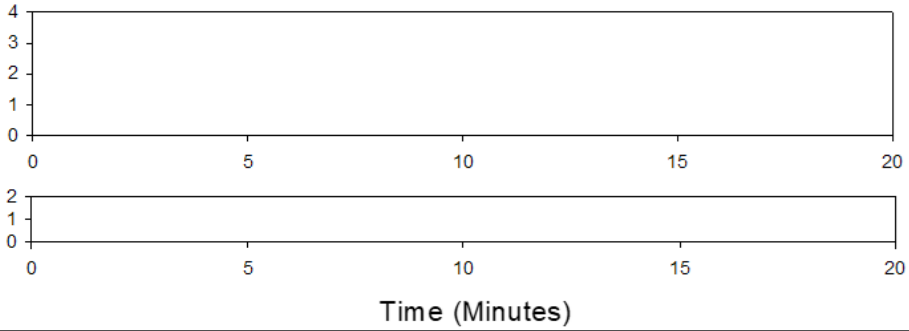
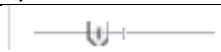
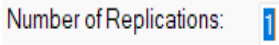
Q1) perform simulation by hand for the single machine single queue system with the following characteristics (4 points)

System	Clock	$B(t)$	$Q(t)$	Arrival times of custs. in queue	Event calendar
Number of completed waiting times in queue	Total of waiting times in queue		Area under $Q(t)$		Area under $B(t)$
$Q(t)$ graph $B(t)$ graph					
Interarrival times	0.87	0.44	0.04	14.41	0.86	2.87	6.14	4.09	0.31
Service times	1.38	1.88	3.90	2.53	0.11	0.05	0.30	1.28	12.29

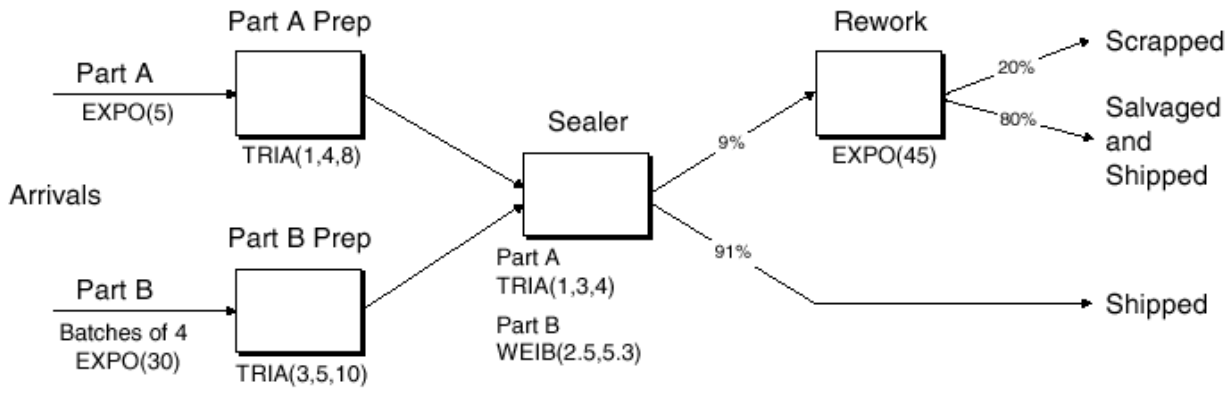
b) Find the average queue size (2 points)

Q2) Find in the meaning of the following symbols in ARENA discrete event simulation (4 points)

Symbol	meaning	Symbol	Meaning
			
			

b) Describe how to add an animation for the resource , and entity (2 points)

Q3) a) show the arena simulation for the system shown in the following figure. Add statistical collection for the number of parts produced and the time in system



Two parts are produced A and B (batches of 4) with interarrival times shown in the figure, the processing times and the percentages scraped and reworked are shown in the figure (4 points)

b)Describe with details how to add animation for TNOW variable (2 points)?

Q4) a) Show the Arena simulation for the following: a call center with 12 trunk lines if the customer finds all lines busy he will leave count the number of customers leaving this way. Customers getting in listen to automatic message for two seconds, then select one of three procedures, support (30%) two workers for 8 hr shift and 1 operator for the 8 hour evening shift it takes tria(2,5,10) minutes, sales (40%) talks with the one of fives sales staff in the morning shift only for tria(2,20, 34) minutes, and order status (40%) which is an automatic message for tria(5,6,7) minutes. Collect statistics about time in system and numbers served. (4 points)

b) for part a) describe how to add an animation for the number of people being served currently in the system (WIP) 2 points?

Q5) Parts arrive at a single machine system according to an exponential interarrival distribution with mean 20 minutes; the fi rst part arrives at time 0. Upon arrival, the parts are processed at a machine. The processing-time distribution is TRIA(11, 16, 18) minutes. The parts are inspected and for each part there is a 0.24 probability that it will need

to be sent back to the same machine to be reprocessed (same processing-time distribution but a fresh draw from it, and all send-back decisions are independent of each other). There's no limit on how many times a given part might have to go through the machine for processing/reprocessing (6 points)