NOTE: Codes verified on Octave using statistics package
Use: pkg load statistics

Answer to Q1

Code: Run TCM_empty_1.m

Changes Done in Given Code:

- Success were averaged over 20 runs to check success retrieval.
- Presentation schedule was fixed to schedule last ten items.
- Question about use of 'delta' - this parameter is being used as a constant drift in world states.
- Question about use of 'beta_param' - this parameter is being used in next question for sampled drift in world states, since sample was to obtain from a gaussian mixture, beta_paramwas used to provide the mixing proportion.
- 'world' states were encoded as retrieval cues in the encoding vector with last column being the item number.
- For finding 'soa' i.e. association dot product is use between the encoding and present world states.

Average success obtained is around ~ 8.8. So, this indicates that the model successfully retrieves about 7 items from the encoded list efficiently.

Answer to Q2

Code: Run TCM_empty_21.m for part 1 and TCM_empty_22.m for part 2.

Part 1:

- Gaussian Mixture for drift were created using following information:
  - First Mean: 0.05 and Second Mean: 2.5
  - Variance for both of them were used to be 1
  - Proportion for mixture was done using beta_param as: beta_param for 0.05 and (1 - beta_param) for 2.5
  - **gmdistribution** function was used for creating the gaussian mixture.
- Drift were randomly sample from the generated gaussian mixtures.
- Last 10 items were encoded.
- Average success is obtained around ~ 8.8

Part 2:

- To minimise the encoding load as well keeping the retrieval success > 7. We need to ensure that the inter-item interval should be high around the mid (to minimise encoding load) but also we need to keep inter-item interval to not to vary much to ensure success > 7
- This was verified by running following scheduling trials:

    - [99 198 297 396 495 594 497 498 499 500]:
        - Success ~ 4.6
        - Encoding load = 5.05 (minimum possible)
    - [1 2 3 4 5 104 203 302 401 500]:
        - Success ~ 4.8
        - Encoding load = 5.05 (minimum possible)
    - [491 492 493 494 495 496 497 498 499 500]:
        - Success ~ 4.8
        - Encoding load = 500 (maximum possible)
- So, to increase inter-item interval for mid item as well as keeping inter-item interval to be equally spaced based possible scheduling is to keep inter-item interval equal and use first scheduling at the start and last encoding at the end. Make sure the last element is in the list. I.e. 500 in our case.
- Obtained Schedule: [5 60 115 170 225 280 335 390 445 500]
    - Algo: ENCODING_TIME - (floor(ENCODING_TIME/(N_ITEMS-1)))*(0:(N_ITEMS-1));
- Average success is obtained around ~ 7.7
- Encoding load: 9.09

Answer to Q3

Code: Run TCM_empty_31.m (scheduling of last ten items) and TCM_empty_32.m (optimal scheduling)

- During retrieval time new gaussian mixture (GM) were modelled using the EM algorithm.
- Used the **fitgmdist** octave function which fita GMM to the given data using EM algorithm.
- Data were stored during encoding.
- After encoding the fitted GM models parameter were used to model world evolution.
- Average success is obtained around ~ 8.8 with scheduling of last ten items.
- Average success is obtained around ~ 7.5 with optimal scheduling used in Q2 part 2.
- Conclusion: Equivalent performance obtained as compared to when retrieval agent knows the world physical model.