Assignment

EE23010: Probability and Random Processes
Indian Institute of Technology,Hyderabad

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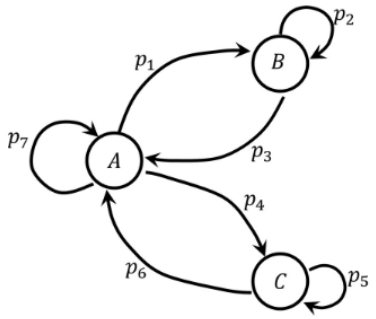
Question: A state transition diagram with states A, B, and C, and transition probabilities p_1, p_2,...., p_7 is shown in the figure (e.g., p_1 denotes the probability of transition from state A to B). For this state diagram, select the statement(s) which is/are universally true



1) $p_2 + p_3 = p_5 + p_6$
2) $p_1 + p_3 = p_4 + p_6$
3) $p_1 + p_4 + p_7 = 1$
4) $p_2 + p_5 + p_7 = 1$

Solution:
From, the given state diagram we can make a Transition matrix as:

$$M = \begin{pmatrix} p_7 & p_1 & p_4 \\ p_3 & p_2 & 0 \\ p_6 & 0 & p_5 \end{pmatrix} \tag{1}$$

And a valid transition matrix for a Markov Chain, the sum of rows should be 1 which gives:

$$p_7 + p_1 + p_4 = 1 \tag{2}$$
$$p_3 + p_2 = 1 \tag{3}$$
$$p_6 + p_5 = 1 \tag{4}$$

From (3) and (4) we have:

$$p_3 + p_2 = p_6 + p_5 \tag{5}$$

$\therefore$ Option (1) and (3) are correct.