Hard | Deputy Executive Engineer (Electric | 2026 | orts Authority of Gujarat / Assistant Engineer (El

A system has gain crossover frequency at which magnitude is unity and phase is 150 degrees, then 1. The phase margin of the system is 30 degrees. 2. The system is

A — All of the above

B — 1 and 4 only

C — 2 and 3 only

D — **1, 2 and 3 only** — Correct

Correct Answer: D

Full Detailed Explanation

Correct Answer: D - 1, 2 and 3 only Quick Concept Explanation Gain margin and phase margin quantify distance from the critical feedback condition and are widely used as relative-stability measures; pole and zero locations shape the frequency response. At gain crossover, phase= 150 , so PM=180 150=30 . Gain margin must be evaluated at phase crossover, so it is not automatically zero here.Exam focus: Positive phase margin usually indicates a stable negative-feedback loop with normal assumptions. Common trap: Frequency response is not independent of poles and zeros. Statement-wise Verification Statement 1 - Correct.The phase margin of the system is 30 degrees.At gain crossover, phase= 150 , so PM=180 150=30 . Statement 2 - Correct.The system is stable based on phase margin criterion.Positive phase margin usually indicates a stable negative-feedback loop with normal assumptions. Statement 3 - Correct.Increasing gain may lead to instability.At gain crossover _gc: PM=180 + G(j _gc). Statement 4 - Incorrect.Gain margin is zero at this operating point.Gain margin is evaluated at phase-crossover frequency, not inferred as zero merely because magnitude is unity at gain crossover Core Concept Frequency response describes how a linear system's gain and phase vary with sinusoidal frequency. Bode plots display logarithmic magnitude and phase. Gain margin