(b) FIGURE 6 shows a proportional plus derivative controller that has a proportional band of 20% and a derivative action time of 0.1 minutes. Construct the shape of the output waveform for the triangular input waveform shown, if the input rises and falls at the rate of 4 units per minute.

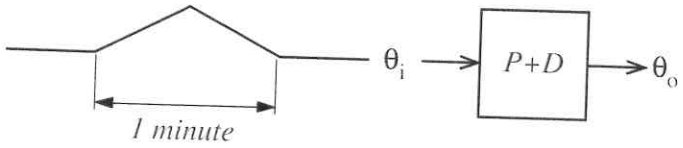

FIG. 6

8. (a) FIGURE 7 shows the closed-loop response of a plant to a step input when the proportional only gain was set to 4. Use the 'Quarter Amplitude Response Method' to estimate the required settings of a P + I + D controller.

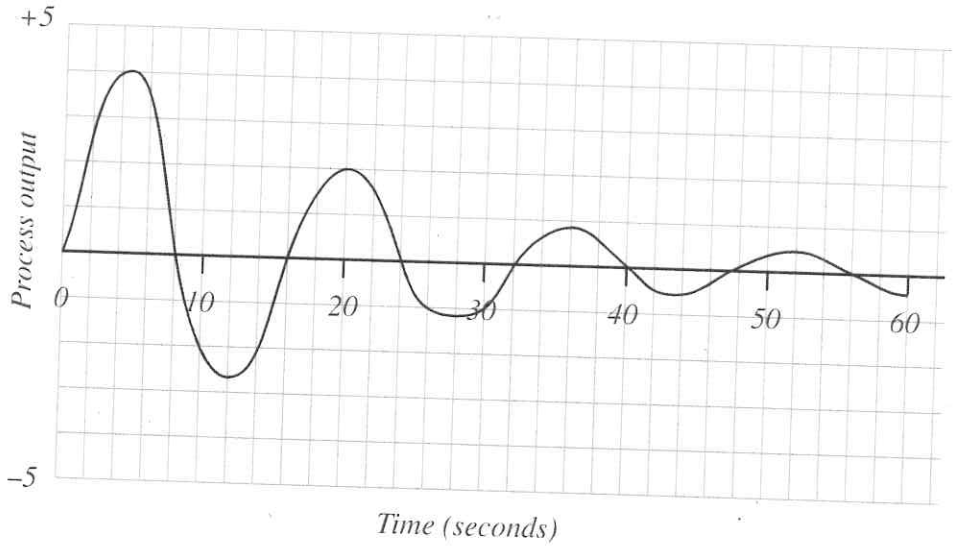

FIG. 7 Plant Response to Step Input

(b) If the same plant was 'tuned' using the 'Ultimate Cycle Method', estimate the P + I + D controller settings if a proportional only gain of 6 was required to produce steady oscillations.