Modelling and control summaries

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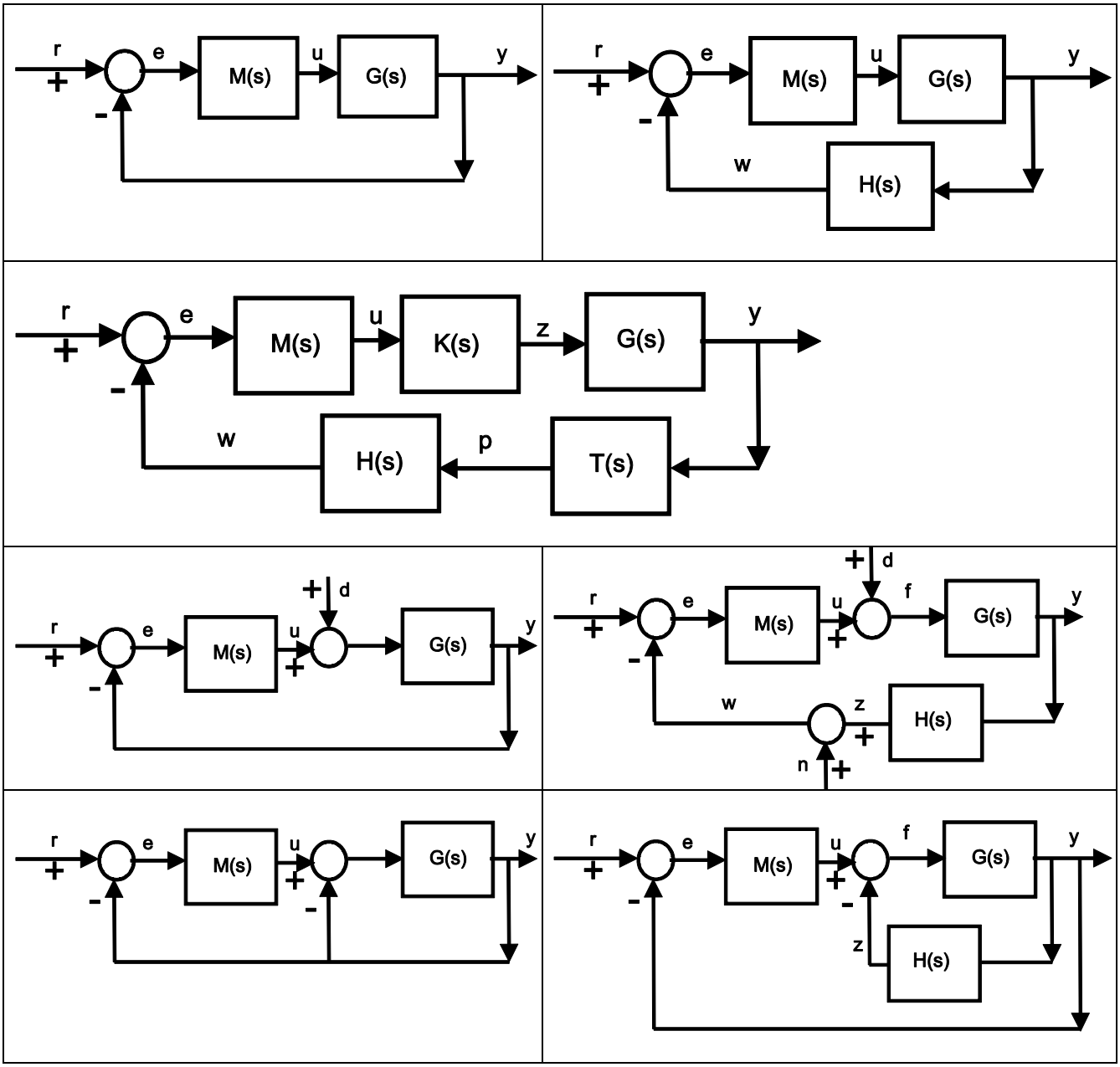
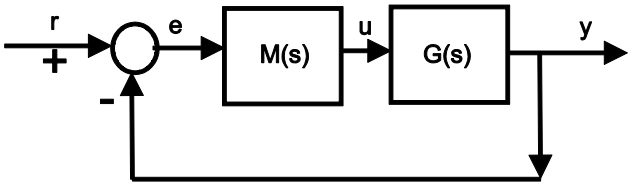
Block diagrams – tutorial sheet

Derive the closed-loop transfer functions from target (r) [and disturbance input (d) if applicable] to error (e), input (u) and output (y) for all the following loops.

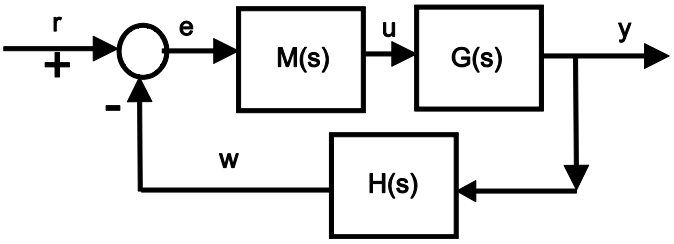


QUESTION 2 Check your answers to question 1 with numbers using the feedback command in MATLAB. SYNTAX is Gc = feedback(FP,RP) where FP is the forward path and RP is the remainder of the complete path (single loops only).

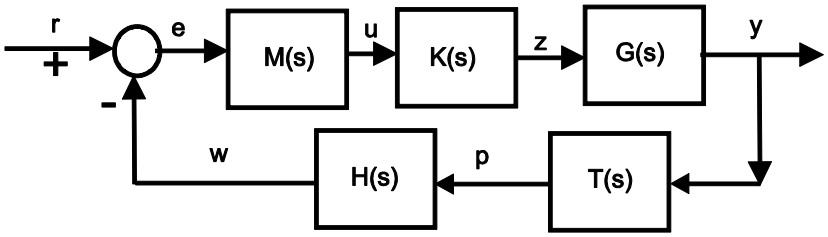


$$G(s)=\frac{3}{s+2};\quad M(s)=\frac{s+1}{s}$$

HINT: using notation u= Gcu * r
Gcu=feedback(M,G)



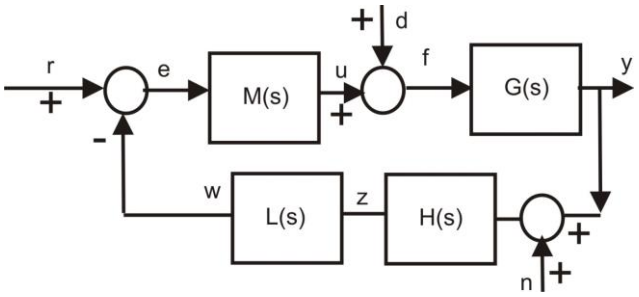
$$G(s)=\frac{0.5}{s+1};\quad M(s)=2\frac{s+0.4}{s};\quad H(s)=0.1\frac{(s+10)}{(s+1)}$$



$$G(s)=\frac{0.5}{s+2};\quad M(s)=2\frac{s+0.5}{s};$$
$$K(s)=0.5;$$
$$H(s)=0.1\frac{(s+8)}{(s+0.8)};\quad T(s)=\frac{2}{s+5}$$

QUESTION 3: For the loop below, find an expression for the signal y(s). Use MATLAB to plot y(t) when r(t) is a unit step, d(t) is a step of size 1 and n(t) is random.

HINT: use superposition to compute effects of r, d and n separately.



$$G(s)=\frac{0.5}{s+2};\quad M(s)=2\frac{s+0.5}{s};$$
$$H(s)=0.1\frac{(s+8)}{(s+0.8)};\quad L(s)=\frac{2}{s+5}$$

QUESTION 4: Analyse the following loop.