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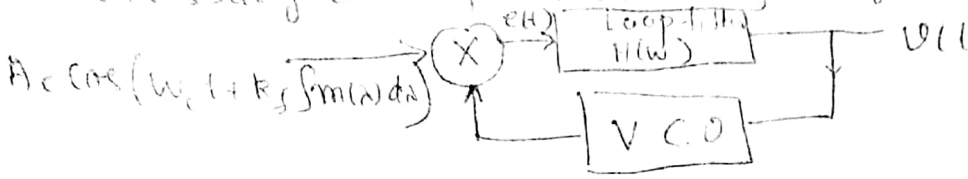
(EEB11, Comm. Engg. Major Exam, Dur. 2 hrs [illegible])

MAKE ASSUMPTIONS, IF REQUIRED

Prob 1 Solve for the system shown below, stating all the necessary assumptions clearly show that $v(t) \propto m(t)$.



(7)

Prob 2 Consider the VSB signal, with $m(t) = A_m \cos \omega_m t$, given as.

$$s(t) = \frac{1}{2} a A_m A_c \cos((\omega_c + \omega_m)t) + \frac{1}{2} A_m A_c (1-a) \cos((\omega_c - \omega_m)t$$

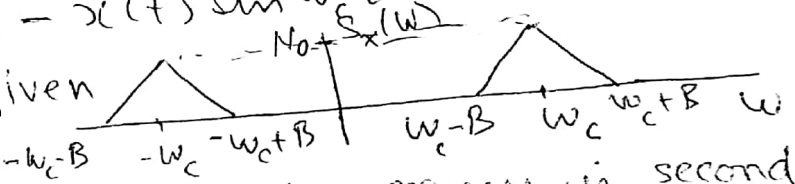
$a < 1$, find (i) In-phase & quadrature phase components of $s(t)$; (ii) With $x(t) = s(t) + A_c \cos(\omega_c t)$ as the input to envelope detector, determine the distortion produced by quadrature component; (iii) value of 'a' for which distortion is worst possible? (8)

Prob 3 Find the figure of merit, with all assumptions clearly stated, for phase modulation. (7)

Prob 4 Find (i) Autocorrelation function; (ii) Power spectral density & (iii) mean power in the signal

$$y(t) = x(t) \cos \omega_c t - \hat{x}(t) \sin \omega_c t$$

where $S_x(\omega)$ is as given



(8)

Prob. 5 (a) Prove or disprove that if a process is second order Ergodic, then it is WSS (second order).

(b) Let $X(n)$ & $Y(n)$ be two jointly W.S.S., zero mean, random processes. We wish to estimate the present sample, $y(n)$, from present & past 'p' samples of $x(n)$ ($\{x(n-k) \mid 0 \le k \le p\}$). Stating all the assumptions clearly, find the estimator. Also state what are the statistical information required for the purpose. (10)

SD Jolhi Prof