	S J P N Trust's HirasugarInstitute of Technology, Nidasoshi. *Inculcating Values, Promoting Prosperity* Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi.	ECE Dept. Exam. Internal Assessment Even Sem(2017-18)

SECOND INTERNAL ASSESSMENT

Sem : IV
Date:13/04/2018

Sub: Principles of Communication Systems
Time: 11:00AM-12.00PM

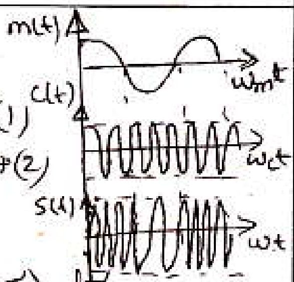
Sub. Code: 15EC45
Max. Marks: 25

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Discription of Question	Marks	CO	RBT LEVEL
1	a	Derive the expression for FM wave assuming both modulating and carrier signals are cosine waveforms. Sketch relavant waveforms	6	CO213. 2	L2
	b	The equation of FM wave is $s(t)=10Sin[5.7x10^8t+5Sin12x10^3t]$. Calculate: i. Carrier frequency ii. Modulating frequency iii. Modulation index iv. Frequency deviation v. Power dissipated in 100 Ohms.	7	CO213. 2	L3
		OR			
2	a	With neat diagram explain FM demodulation using Balanced Slope Detector.	6	CO213. 2	L2
	b	When a 50.0MHz carrier is frequency modulated by a sinusoidal AF modulating signal, the highest frequency reached is 50.075MHz. Calculate: i. The frequency deviation produced ii. Carrier swing of the wave iii. Lowest frequency reached	7	CO213. 2	L3
3	a	Explain linear model of PLL. Also, clearly explain how PLL is helpful in FM modulation and demodulation schemes.	6	CO213. 2	L2
	b	For FM wave represented by $s(t)=5Sin[2\pi x88x10^6t+5Sin1250t]$. Find β, maximum deviation and BW.	6	CO213. 2	L3
		OR			
4	a	With block diagram explain: Super heterodyne receiver and significance of RF amplifier and IF stages. Give typical values of IF used commercially for AM, FM, TV, and RADAR applications.	6	CO213. 2	L2
	b	i. With relevant block diagram explain FM stereo multiplexing and de-multiplexing. ii. An FM SHR is having a local oscillator frequency of 100.7MHz. Find f_s and f_{si}. (Choose suitable IF).	4+2	CO213. 2	L3

Course Coordinator **Module Coordinator** **HOD**

SCHEME OF EVALUATION IA-II (15EC45)

Sem : IV	Subject : Principles of Commn. System		Sub Code : 15EC45	Date : 13/04/2018	
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
1	(a)	Expression for FM: $m(t) = A_m \cos \omega_m t \rightarrow (1)$ $c(t) = A_c \cos(\omega_c t + \phi) \rightarrow (2)$ $f_i(t) = f_c + K_f m(t)$ $\theta_i(t) = 2\pi f_c t + 2\pi K_f \int_0^t m(\tau).d\tau$ $\therefore s(t) = A_c \cos\left[2\pi f_c t + \int_0^t A_m \cos\omega_m \tau . d\tau\right]$ $= A_c \cos\left[2\pi f_c t + A_m 2\pi K_f \left(\frac{\sin \omega_m \tau}{\omega_m}\right)_0^t\right]$ $= A_c \cos\left[2\pi f_c t + \frac{2\pi K_f A_m}{2\pi f_m} \sin \omega_m t\right]$ $= A_c \cos\left[2\pi f_c t + \frac{\Delta f}{f_m} \sin \omega_m t\right]; \Delta f = K_f A_m$ $= A_c \cos(2\pi f_c t + \beta \sin \omega_m t); \beta = \frac{\Delta f}{f_m}$ 	06 (05+01)	CO2,L3.2	L2
	(b)	Given Eqn: $s(t) = 10 \sin[5.7\times10^8 t + 5 \sin 12\times10^3 t)$ $\Rightarrow$ i) $f_c = \frac{5.7\times10^8}{2\pi} = 90.71 MHz$ // ii) $f_m = \frac{12\times10^3}{2\pi} = 1.90 KHz$ // iii) $\beta = 5$ (on comparison) iv) Freq. deviation $= \beta . f_m = 5\times1.9 KHz = 9.5 KHz$ v Power dissipated $= \frac{A_c^2}{2R} = \frac{(10)^2}{2\times100} = 0.5W$.	07	-do-	L3
2	(a)	Circuit diagram of Balanced slope detector and its characteristics are expected Explaination: 04 diagram & chars: 02	06	-do-	L2

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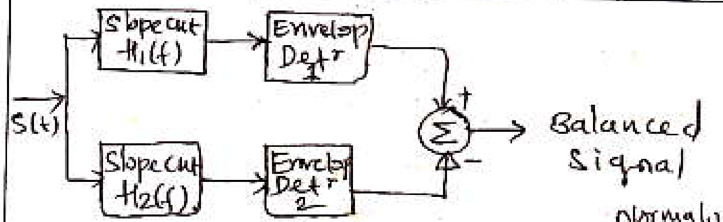
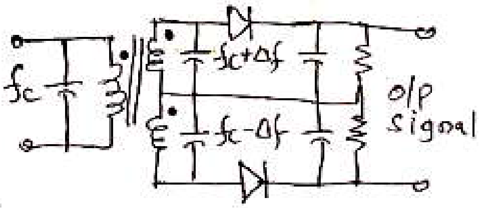
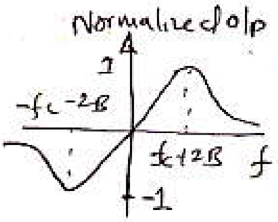
SCHEME OF EVALUATION IA-II 15EC45

Sem : IV	Subject : Principles of Commn System		Sub Code : 45	Date : 13/04/2018		
Q. No.	**Bit**	**Description**		**Marks**	**CO's**	**RBT LEVEL**







2 (b) — Marks: 06 (02×03) — CO's: CO213.2 — RBT: L3

$f_c = 50MHz$; $f_c+\Delta f = 50.075MHz$

i) $\Delta f = 50.075MHz - 50MHz = 0.075MHz = 75KHz$

ii) carrier swing $= 50-0.075$ to $50+0.075$ (MHz)

$= 49.925MHz - 50.075MHz$

Total of 150KHz. deviation

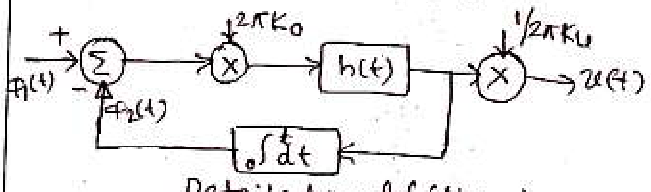
iii) Lowest freq reached : $50-0.075$ MHz

$= 49.925MHz$//

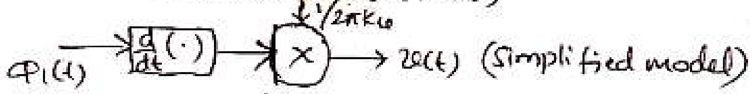
3 (a) — Marks: 06 — CO's: -do- — RBT: L2

Linear Model of the PLL

$\sin(\phi_e(t)) \cong \phi_e(t)$ $\quad \phi_e \cong 0$//



Detailed model (Linear)



$\phi_e(f) = \frac{1}{1+L(f)}\phi_1(f)$ where $L(f) = K_0 \frac{H(f)}{jf}$

& $V(f) = \frac{K_0}{K_v} H(f)\phi_e(f)$

$V(f) \cong \frac{jf}{K_v}\phi_1(f) \Rightarrow v(t) \cong \frac{1}{2\pi K_v} \frac{d}{dt}\phi(t)$

$\Rightarrow v(t) = \frac{K_f}{K_v} m(t)$

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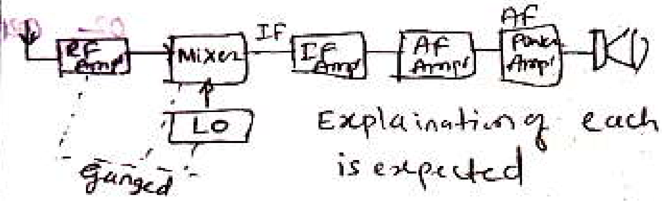
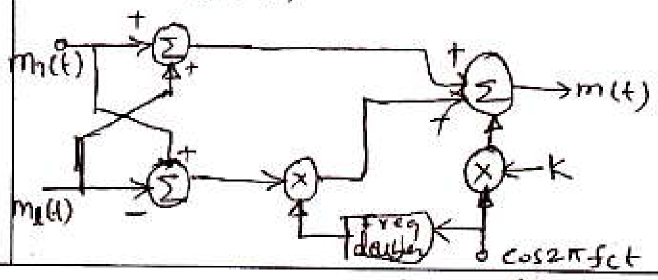
Exam. Scheme
Even Sem (2017-18)

SCHEME OF EVALUATION IA-II 15EC45

Sem : IV	Subject : principles of Commn System	Sub Code : 15EC45	Date : 13/04/2018		
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
3	(b)	$s(t) = 5\sin[2\pi \times 88\times10^6 t) + 5\sin 1250t]$ $\Rightarrow 5\sin[2\pi\times88\times10^6 t + 5\sin 1250t]$ $\Rightarrow \beta = 5$ $\Delta f = \beta \cdot f_m = 5 \times \frac{1250}{2\pi} = 994.71Hz$ $BW_{FM} = 2(\Delta f + f_m) = 2(994.71 + 198.94)$ $= 2387.30Hz$	06	CO213.2	L3
4	(a)	Block Diagram:  Explaination of each stage is expected → Mixer produces IF from RF & LO difference ⇒ IF ampr further amplifies signal ⇒ AF voltage & power amplifiers produce hi-fi signal RF Ampr: Selectivity, mixing of LO with Antenna removal of fsi IF stages: Amplification of mixer o/p to get good fidelity. IF: AM: 455kHz, FM: 10.7MHz, TV: 33.4 & 38.9 MHz RADAR: 30MHz	06	-do-	L2
	(b)	FM stereo (MUX) 	06 (04+02)	-do-	L3

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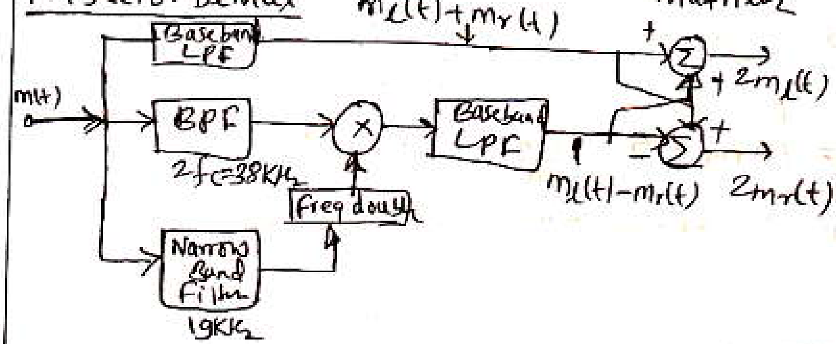
SCHEME OF EVALUATION IA-II

Sem : IV	Subject : principles of Commun System		Sub Code : 15EC45	Date : 13/04/2018		
Q. No.	**Bit**	**Description**		**Marks**	**CO's**	**RBT LEVEL**
Q4	(b)	cont'd				
	(i)	FM Stero-Demux 		04		
	(ii)	$f_o = 100.7MHz$; $f_i = 10.7MHz$ $\therefore f_s = 100.7MHz - 10.7MHz = 90MHz$ $f_{si} = f_o + f_i = 100.7MHz + 10.7MHz = 111.4MHz$		02	CO3.2	L3

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