(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2481 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

ANALOG SIGNAL PROCESSING

Time : 2 Hours *Total Marks : 50*

Note : Attempt **all** questions. All questions carry equal marks. Assume any data missing suitably.

1. Attempt any **two** questions : **(7×2=14)**

   (a) Design an integrator circuit having an input impedance of 1kΩ, time constant = 1ms. What is the gain at $\omega_0 = 100$ rad/sec and $\omega_0 = 1000$ rad/sec. At what frequency the gain becomes unity?

   (b) Draw the circuit diagram of a non-inverting differentiator using one op-amp. Derive its transfer function and draw its frequency response and phase response.

   (c) Design the circuit shown in Figure-1 using the equation $-V_0 = 6V_1 + 4V_2 - 9V_3$. Using the concept of 2-port network explain the negative impedance converter (NIC),

positive impedance converter (PIC), negative impedance inverter (NII), positive impedance inverter (PII)

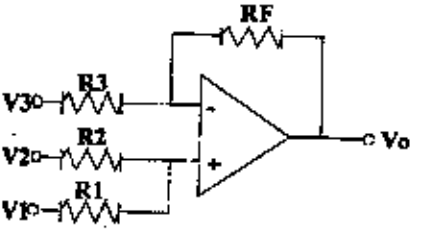

Figure-1

2. Attempt any **two** questions : **(6×2=12)**

(a) Explain the operation of the circuit shown in Figure-2 and calculate the expression for output voltage V_{01} and V_{02}. Also draw the nature of output waveforms for V_{01} and V_{02}.

(b) Explain the operation of a precision AC/DC converter with the help of a neatly labeled circuit diagram.

(c) With the help of a neatly labeled circuit diagram explain the operation of an rms-to-dc converter and an amplitude demodulator.

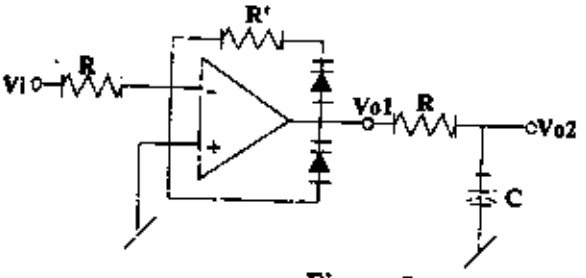

Figure-2

3. Attempt any **two** questions : **(6×2=12)**

(a) Design the circuit of a logarithmic multiplier which gives an output voltage given by the equation $-V_0 \alpha V_{i1} \cdot V_{i2}$.

(b) Design a circuit using analog multiplier which produces and output given by the equation $-V_0 \alpha (V_{i1} \cdot V_{i2})^{1/2}$.

(c) Explain the operation of a voltage limiter circuit with the help of a neatly labeled circuit diagram.

4. Attempt any **two** questions : **(6×2=12)**

(a) For the circuit diagram shown in Figure-3 derive the expression for V_o/V_i. Select the type of admittances either resistive or capacitive such that the circuit realizes a low-

pass filter, high-pass filter and band-stop filter. Find the filter parameters.

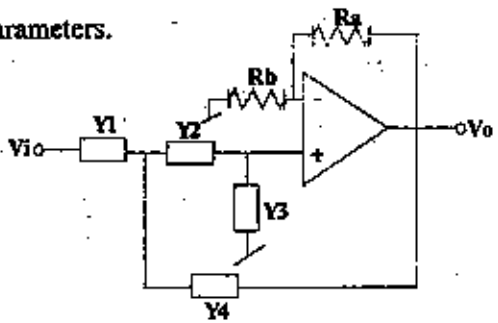

Figure-3

(b) For the circuit shown in Figure-4 obtain the transfer function for low-pass filter and band-pass filter. What additional hardware is required to realize high-pass, notch and all-pass filters ?

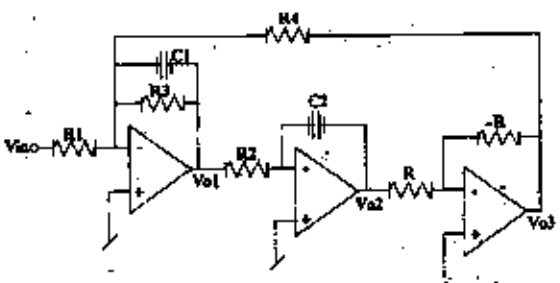

Figure-4

(c) Using OTAs draw the circuit which realizes a grounded inductor and floating inductor and derive the expression for equivalent inductances.