V SEMESTER BE (ICE)

END SEMESTER EXAMINATION, Nov., 2014

IC-301: Analog and Digital Communication

Time: 3:00 Hrs. Max. Marks: 70

Note: *Question No. 1 is cumpulsory to answer and then answer any FOUR Questions from the rest.*

Q1. Select your choice appropriately for the following statements. [10X1]

(a) The sampling of a function $f(t)\sin(2\pi f_0 t)$ starts from a zero crossing. The signal can be unambiguously detected if sampling time T is

(a) $T=\frac{1}{2f_0}$ (b) $T>\frac{1}{2f_0}$ (c) $T<\frac{1}{2f_0}$ (d) $T\leq\frac{1}{2f_0}$

(b) Find the value of the integral $\int_{-1}^{2}[t^4+1]\delta(t-1)dt$

(c) A trigonometric Fourier Series has
1.single sided spectrum
2.double-sided spectrum
3.power spectrum
4.all of above

(d) The magnitude spectrum of a Fourier Transform of a real valued time signal has
1.Odd symmetry
2.even symmetry
3.conjugate symmetry
4.no symmetry

(e) The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
(a) unchanged (b) halved (c) increased by 50% (d) Quadrupled

(f) The stationary process has
1.ensemble average equal to time average
2.all the statistical properties dependent on time
3.all the statistical properties independent of time
4.zero variance

(g) The probability density function of a random variable X is given by:

$$f(x)=\begin{cases}\frac{1}{b-a}, & a\leq x\leq b\\ 0, & otherwise\end{cases}$$

The variable X is said to have
1.Poisson distribution
2.Gaussian distribution
3.Rayleigh distribution
4.uniform distribution

(h) The white noise and an impulse function is similar in following respects
(a) both have similar magnitude spectrum
(b) both have similar phase spectrum

(c) both have similar magnitude and phase spectrum
(d) they have nothing similar

(i) The PAM signal can be detected by
(a) bandpass filter (b) bandstop filter (c) high pass filter (d) low pass filter

(j) In PCM, if the number of quantization levels is increased from 4 to 64, then the bandwidth requirement will appropriately be
(a) 3 times (b) 4 times (c) 8 times (d) 16 times

Q2. Five telemetry signals, each of bandwidth 1 Khz are to be transmitted simultaneously by binary PCM. The maximum tolerable error in sample amplitudes is 0.2% of the peak signal amplitude. The signal must be sampled at least 20% above the Nyquist rate. Framing and synchronizing requires an additional 0.5% extra bits. Determine the minimum possible data rate that must be transmitted, and the minimum bandwidth required to transmit this signal. [15]

Q3.

(a) Differentiate between Probability Density Function and Probability Distribution Function. [4]

(b) What happens when sampling rate is lower than Nyquist rate? Justify your answer with proper evidence. [6]

(c) Differentiate between PAM, PWM, and PPM. [5]

Q4.

(a) Differentiate between Trigonometric Fourier Series and Exponential Fourier Series forms of representation of any time-limited signal. Establish the relationship between their coefficients. In what ratio these coefficients will change if the signal becomes periodic? [9]

(b) State and prove Parseval's Theorem. [6]

Q5.

(a) A surface is ruled with parallel lines, which are at distance d from each other. Suppose that we throw a needle of length l on the surface at random. What is the probability that the needle will intersect one of the lines. (Assume suitable conditions and data). [8]

(b) Differentiate between ensemble averages and time-averages. What do you mean by Wide-sense Stationary Random Processes? Enumerate the properties of Wide-sense Stationary Random Processes. [7]

Q6.

(a) The signal $x(t)=0.5+1.5\cos[(\frac{2}{3})\pi t]+0.5\sin[(\frac{2}{3})\pi t]V$ is passed through an RC low-pass filter of R = 1 ohm and C = 1 F. Find the input PSD and output PSD. [8]

(b) Explain all the stages required to generate PCM signal from a given analog signal. [7]

Q7.

(a) Explain the operation and uses of Matched Filter. [8]

(b) Describe the importance of Digitally Modulated Bandpass Signaling System used in Communication. [7]

Q8. Write SHORT notes on any THREE of the following topics. [3X5]

(a) Importance and uses of Eye Diagram used in Communication.
(b) Characteristics of Line Codes used for Digital Signaling.
(c) Difference between Natural Sampling and Instantaneous Sampling.
(d) Generation of Frequency Modulated Wave.
(e) Difference between ASK and QPSK

Roll No:.....

B.E. (ICE)-V SEMESTER END-TERM EXAMINATION, Nov. 14

COURSE CODE: IC-302 TITLE: Industrial and Analytical Instruments

TIME ALLOWED: 3Hrs. M.M: 70

Note: Attempt any FIVE questions. Assume missing data suitably, if any.

Q.1 [7+7=14]

[1] Explain the working principle and hence deduce an expression for the flow rate for a transit time ultrasonic flow meter.

[2] A transit time ultrasonic flowmeter uses a pair of ultrasonic transducers placed at 45° angle, as shown in the Figure 1. The inner diameter of the pipe is 0.5 m. The differential transit time is directly measured using a clock of frequency 5 MHz. The velocity of the fluid is small compared to the velocity of sound in the static fluid, which is 1500 m/s and the size of the crystals is negligible compared to the diameter of the pipe. What is the minimum change in fluid velocity (m/s) that can be detected using this scheme?

Q.2 [6+3+5=14]

[1] Discus the working of a digital pH meter making use of an ISFET.

[2] A pH electrode obeys Nernst equation and is being operated at 25°C. What will be the change in the open circuit voltage in millivolts across the electrode for a pH change from 6 to 8?

[3] Explain the use of a differential pressure cell for continuous measurement of process fluid density. Draw a schematic diagram and explain the measurement setup.

Q.3 [6+3+5=14]

[1] Describe with the help of neat block diagram the functioning of a gas chromatograph.

[2] Explain the working of a katharometer.

[3] A sample containing oxygen and nitrogen is injected into a helium carrier at time $t = 0$. The sample is swept through a column 1.0 m long packed with molecular sieve. The eluting components are detected by a katharometer detector which has an equal sensitivity for oxygen and nitrogen. The time variation in katharometer output voltage is shown in Figure 2.

i. Estimate base width Δt for both peaks and hence find the resolution R.

ii. Estimate the number of theoretical plates N and HETP.

iii. Estimate the percentage composition of the sample (assume approximately triangular peaks).

Q.4 [5+5+4=14]

[1] Explain the working of rotating cylinder viscometers with neat sketch.

[2] Explain the working of any ONE type of hygrometer with neat sketch.

[2] Viscosity of a solution was measured using rotating cylinder method. Inner cylinder of 20cm diameter was stationary. Outer cylinder of 20.4cm diameter contained the solution up to a height of 40cm. The outer cylinder was rotated at 500 rpm ant the torque register was found to be 9.8N-m. Calculate the viscosity of the solution under test in poise.

Q.5 [7+7=14]

[1] Explain in detail the functioning of AAS.

[2] Describe with neat diagram the function of following spectroscopic instruments i) Single beam ii) Double beam in space iii) Double beam in time.

Q.6 [7+7=14]

[1] Explain the working principle of a sector type mass spectrometer.

[2] What accelerating potential will be required to direct a singly charged water molecule through exit slit of the above spectrometer if the magnet has field strength of 0.24T and the radius of the path is 12.7cm.

Q7. [7+7=14]

[1] A room thermostate was set to switch on at 23°C.To check the accuracy of this setting an accurate device was used to measure the temperature and following 30 readings were taken. Find the uncertainty in the measured temperature.

24, 23, 22, 20, 23, 24, 21, 22, 22, 21, 20, 25, 24, 21, 23, 22, 22, 24, 21, 22, 25, 24, 23, 22, 23, 25, 21, 24, 24, 21.

[2] Following three experiments were conducted to estimate the speed of light. Determine the best estimate of the velocity of light and find the least error by combining the data of all the three sets.

Experiment A: 10 measurement were performed and the mean velocity was recorded as 2.9985×10^{10} cm/s with a mean square deviation of 4.41×10^{15} $(cm/s)^2$.

Experiment B: 17 measurement were performed and the mean velocity was recorded as 2.9972×10^{10} cm/s with a mean square deviation of 2.25×10^{14} $(cm/s)^2$.

Experiment C: 10 measurement were performed and the mean velocity was recorded as 2.9979×10^{10} cm/s with a mean square deviation of 1.02×10^{15} $(cm/s)^2$.

Q8. Write short notes any **THREE** [14]

i) IR spectrometer ii) Displacement type level sensor iii) Pirani gauge iv) Dead weight tester v) Time of flight mass spectrometer

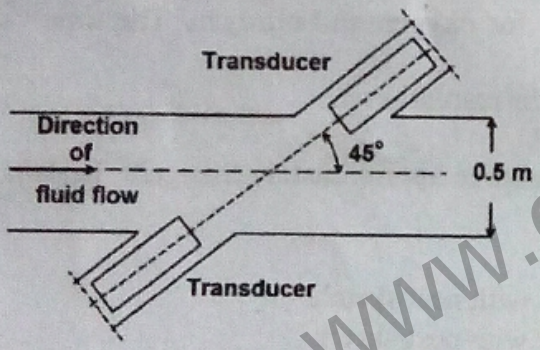


Figure 1

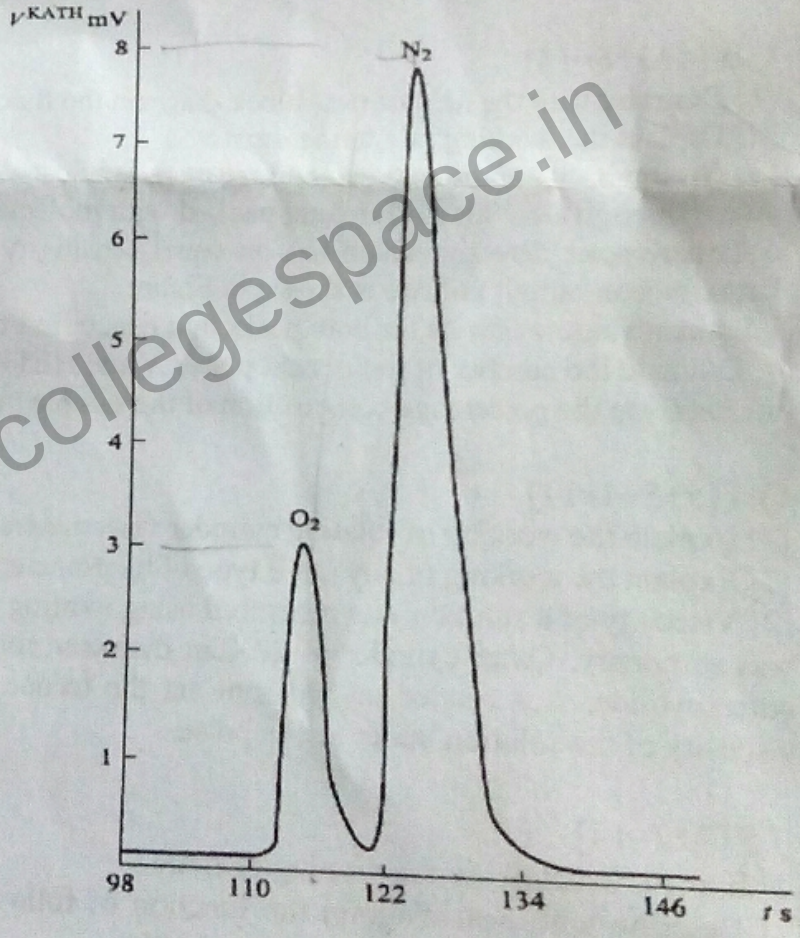


Figure 2

V[TH] SEMESTER **BE (ICE)**

END SEMESTER EXAMINATION NOV - 2014

ICE 303: DIGITAL INTEGRATED CIRCUITS – I

Time : 3 Hr. Max. Marks: 70

NOTE:
1. **Attempt any five questions**
2. **All questions carry equal marks**
3. **Attempt all parts of the same question at the same place**

Q1a) (i) Find the 16's complement of $(AF3B)_H$.

(ii) Find the 10's complement of $(00000)_D$.

(iii) Represent $(905)_D$ in BCD.

(iv) Perform the subtraction $(287)_9$-$(365)_7$ and give the result in base 5.

(v) Multiply the numbers $(2E)_H$ and $(34)_H$ without converting to decimal.

(vi) Represent $(-35)_D$ in 8-bit 2's complement representation. [1+1+1+2+1+1]

b) Show that the dual of ex-OR is its complement. [3]

c) Reduce the following expression to five literals only using Boolean Algebra.

$F(A,B,C) = ABC + \bar{A}\bar{B}C + \bar{A}BC + AB\bar{C} + \bar{A}\bar{B}\bar{C}$

Implement the reduced expression using AND and NOT gates only. [4]

Q2a) Find the maxterms of the expression

$F(A,B,C,D) = \bar{C}D + AB\bar{C} + AB\bar{D} + \bar{A}\bar{B}D$ [4]

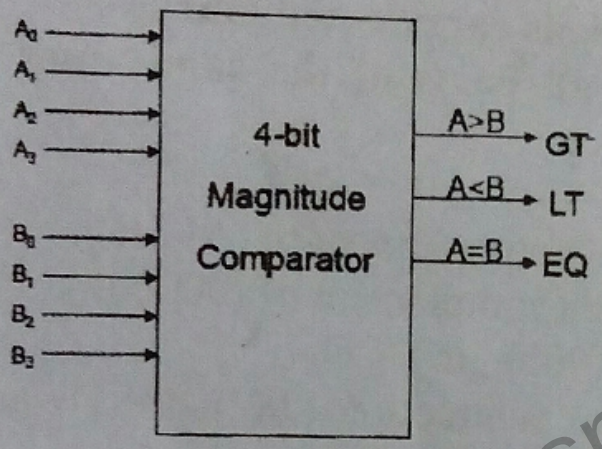
b) Simplify the following expression using k-map to seven literals only.

$F(A,B,C,D) = \sum(0,2,5,7,10,13) + d(1,3,4,6)$

Implement the simplified circuit using basic logic gates.

c) Design a 4-bit one's complement adder / subtractor using only Full adders and half adders. [5]

Q3a) Given two 4-bit unsigned numbers, design a circuit such that the output is the larger of the two numbers. Use 4-bit magnitude comparator and Quad 2X1 MUX only. A 4-bit magnitude comparator has the following structure (Fig 1). [5]



(Fig 1) [7]

b) A BCD code is being transmitted to a remote receiver. The bits A_3, A_2, A_1, A_0 with A_3 as the MSB. The receiver circuitry includes a BCD error detector circuit that examines the received code to see if it is a legal BCD code. Design this circuit to produce a HIGH for any error condition. [7]

Q4a) Design a logic circuit that controls the passage of a signal A according to the following requirements.

1. Output X will equal A when control inputs B and C are the same.
2. X will remain HIGH when B and C are different. [7]

b) Implement the following Boolean function using PAL

$F1 = \sum(5,11,15)$

$F2 = \sum(7,8,10,12,14,15)$ [7]

Q5a) A sequential circuit has two JK flip-flops, one input x and one output y. The logic diagram of the circuit is shown in Fig 2. Derive the state table and the state diagram. [7]

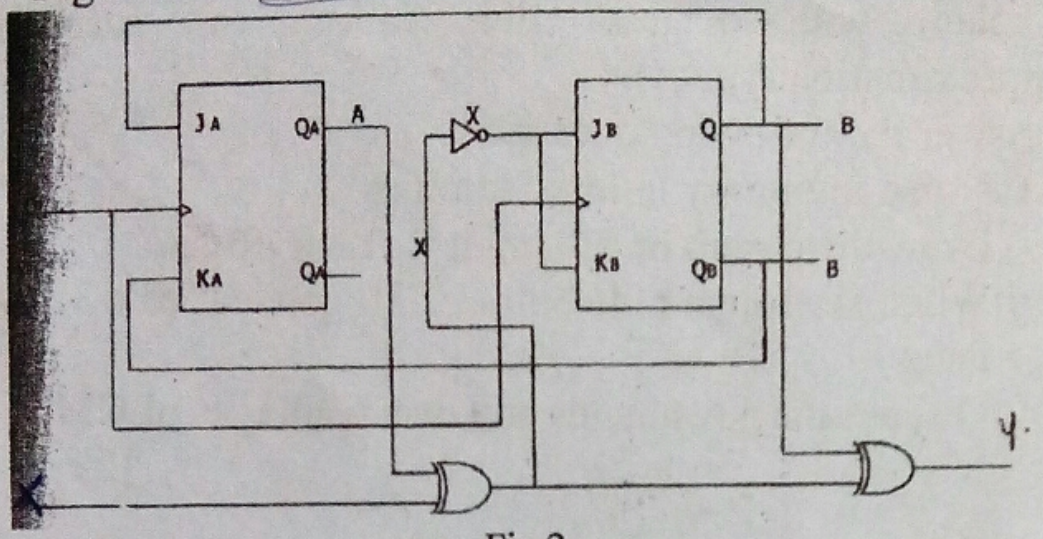


Fig 2

b) Implement the state diagram of Fig 3 using T flip-flop. [7]

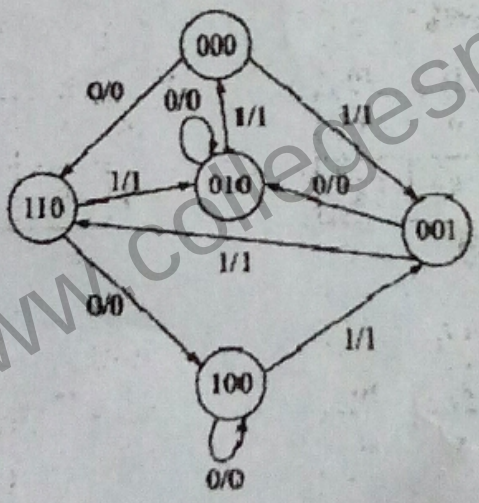


Fig 3

Q6a) Design a 4-bit serial register that can be loaded or cleared (all zeros) synchronously. [7]

b) Explain the working of monostable multivibrator using 555 timer. [7]

Q7a) Calculate the values of LSB, MSB and full-scale output for a 8-bit DAC for 0-12V range. [3]

b) Explain with diagram the working of successive approximation type ADC. [3]

c) Answer the following questions:

(i) Noise Immunity in logic families.

(ii) Draw the circuit of a 2-input RTL NOR gate.

(iii) When is a totem pole output TTL gate called a 3-state gate.

(iv) Discuss the advantages and disadvantages of CMOS ICs. [2 each]

Roll No ..... No. of pages: 05 Date .....

End Semester Examination, November-2014
V^th Semester B.E. (ECE/COE/ICE)
ECE/COE/ICE-304: Linear Integrated Circuits

Time: 3 Hrs. **Max. Marks: 70**

Note: Attempt any ten questions. All questions carry equal marks. Assume missing data, if any, and mention the same in your answer.

1. Find the expression for input impedance $Z_{in}(s)$ realized by the circuit shown in Fig.1 and show its passive equivalent.

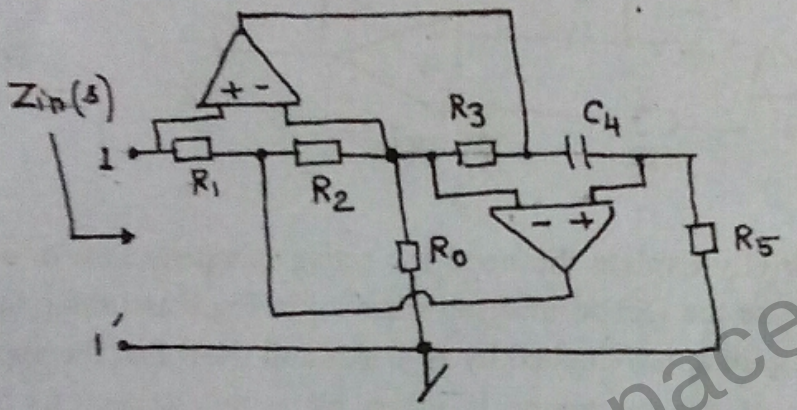


Fig.1

2. Assuming ideal op-amps, find out the condition of oscillation and frequency of oscillation for the sinusoidal oscillator circuit of Fig.2.

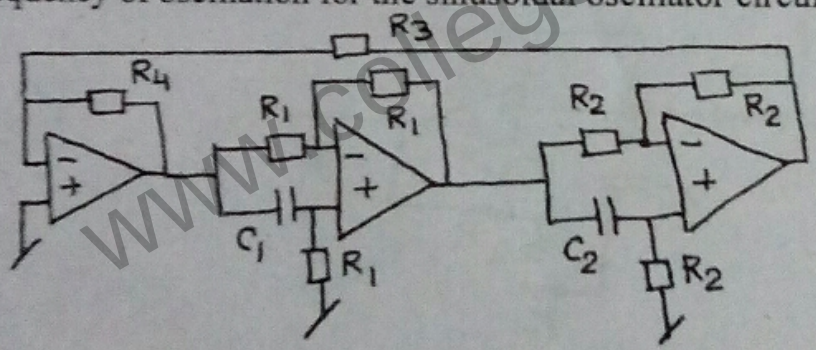


Fig.2

3. Determine the relationship between inputs and output for the circuit in Fig.3, assuming ideal op-amps.

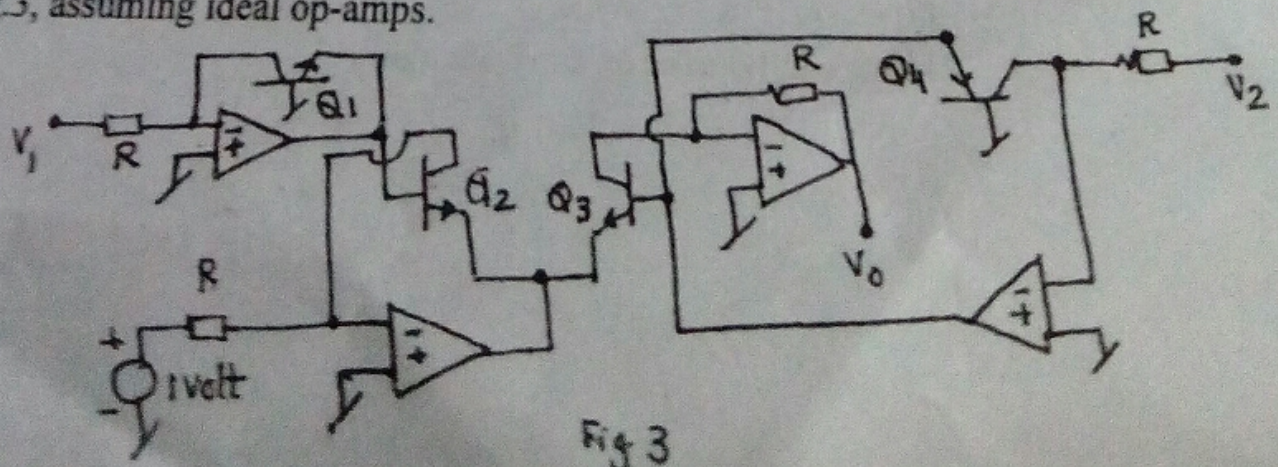


Fig 3

4. What are the advantages of OTA-C active filters over op-amp active filters? Analyze the circuit shown in Fig. 4 and show that by proper choice of inputs v_a, v_b, and v_c one can realize any of the five standard filter responses from the circuit?

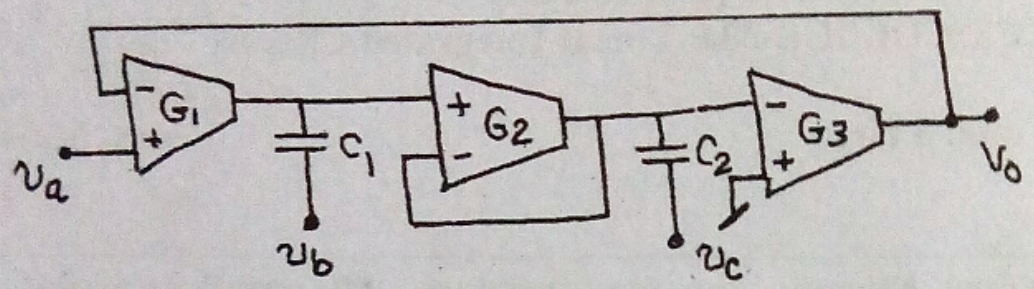


Fig. 4

5. Assuming ideal op-amp, show that the circuit of Fig. 5 realizes a band pass function. Design a band pass filter with f_o =1 kHz, Q=10, H_o=10.

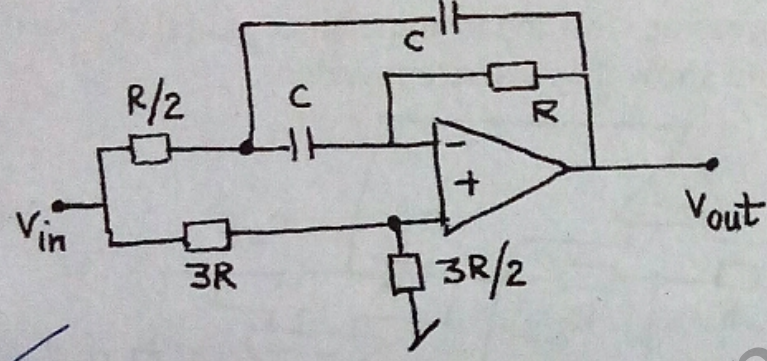


Fig. 5

6. Briefly explain the need for active compensation in op-amp circuits. Analyze the Deboo integrator shown in Fig.6 assuming the op-amp open loop gain approximated by $A \cong \omega_t/s$ and show that the approximate phase error of the integrator is given by $\varphi \cong -2(\omega/\omega_t)$, for $\omega < \omega_t$ (where $\omega_0=1/(RC)$ may be considered as negligibly smaller than ω_t).

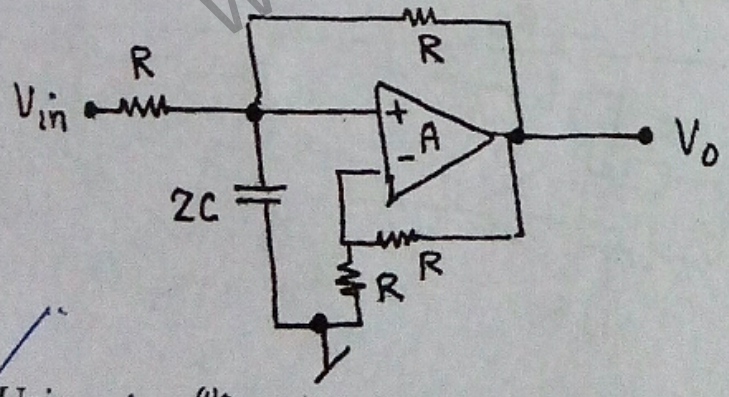


Fig. 6

7. Using $A \cong \frac{\omega_t}{s}$, determine the type of the filter realized by the circuit shown in Fig. 7. What is the approximate frequency up to which this circuit can be used as a differentiator?

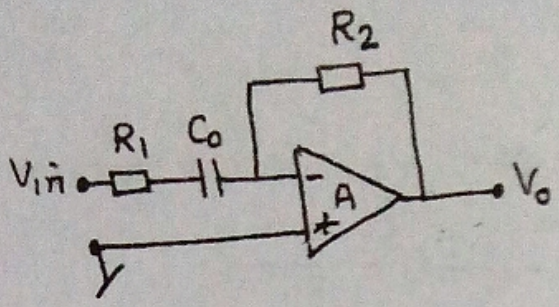


Fig.7

8. For the IC-Timer-based circuit shown in Fig. 8, determine an expression for the frequency of the output waveform by sketching relevant waveforms.

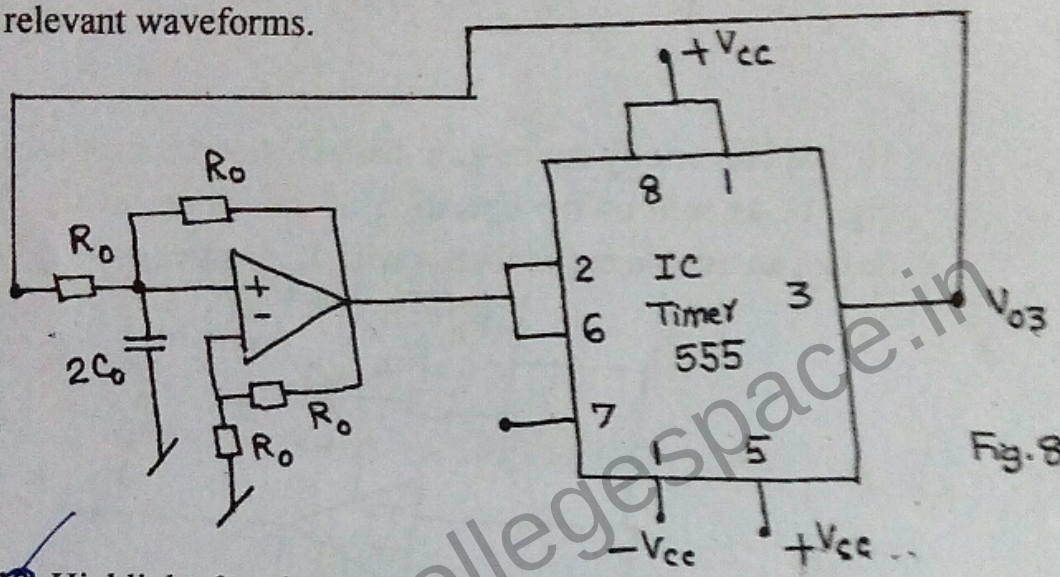


Fig.8

10. Highlight *four* important applications of multipliers. Find the relation between input resistance and control voltage for the circuit shown in Fig. 9.

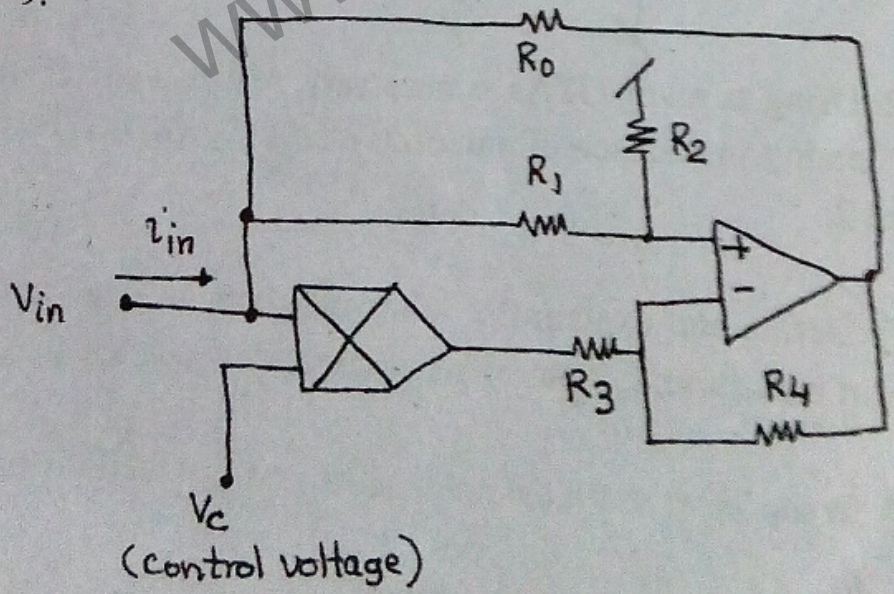


Fig.9

10. Determine the OTA-equivalent of the circuit of Fig.10 and derive its transfer function.

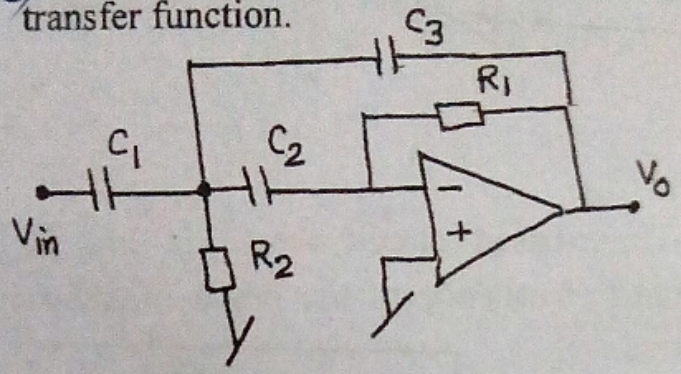
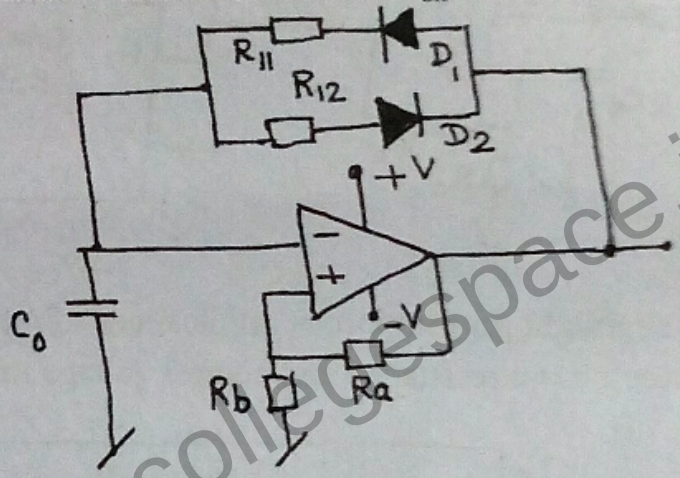


Fig. 10

11. Explain briefly the op-amp-based Schmitt trigger used in the circuit of Fig. 11 as well as the operation of the entire circuit. Using this circuit design an astable multivibrator with T_{on}=1 msec and T_{off}=2 msec.



D1, D2 are ideal diodes

Fig. 11

12. Using as many OTAs as necessary, realize a circuit which can realize a floating impedance of value $Z(s)=s^2C_1\,C_2/\,G_1G_2G_3$ between its ports 1 and 2.

13. Define and explain the following terms as applicable to an op-amp: input bias current, input offset voltage, slew rate and CMRR.

14. Write *short* technical notes on any two of the following:

(a) Gilbert multiplier cell
(b) IC phase-locked-loop
(c) Basic building blocks of an IC op-amp
(d) Voltage-controlled-oscillators

End Semester Examination – November 2014

ECE/COE/ICE 305

Industrial Organization and Managerial Economics

Time 3 Hours **Maximum Marks 70**

Instruction: 1.Attempt any FIVE question.
2. Assume suitable missing data, if any.

Q.1.a) Differentiate between continuous and intermittent production systems with suitable examples.....(8)
b) Explain briefly the following terms - 'loading', 'scheduling', 'dispatching', 'routing'.....(6)

Q.2. a) What is sales forecasting? Explain any five important sales forecasting techniques used in production planning.....(10)
b) The annual cost data of an enterprise for the year 2011-2012 are as follows:
Fixed Cost = Rs. 500000 (5 Lakhs)
Annual Sales Volume = 1500000 (15 Lakhs)
Input variable cost per unit = R.25
Unit sale price = Rs. 150

i) Determine Break Even Point
ii) If a profit target of Rs. 750000 (7.5 lakhs) has been budgeted, calculate the sales volume required.....(4)

Q.3. a) Differentiate between CPM and PERT.....(6)
b) A small engineering project consists of 6 activities namely A, B, C, D, E, and F with duration of 4, 6, 5, 4, 3 and 3 days respectively. Draw a network diagram and calculate EST, LAST, EFT, LFT and floats. Mark the critical path and find total project duration.....(8)

Q.4. a) Explain important principles of motion economy.....(8)
b) Explain briefly – SIMO chart, Therbligs, String diagram, Multiple Activity chart...(6)

Q.5. a) What types of managerial decisions are required in an organization?....(8)

b) Explain any two important qualitative and two quantitative techniques used in decision making process in an organization……(6)

Q.6. Write short notes on any four of the following - (14)
i) Business ethics, ii) Shares and debentures, iii) MBO, iv) Objectives of Personnel Management, v) Capital, vi) SWOT analysis, vii) Group Dynamics viii) unemployment

Q.7. a) Define terms: Performance rating, Normal time, Standard time…(6)
b) What kinds of allowances are added to the normal time of industrial production?…..(8)

Q.8. a) 'Macroeconomics is the study of whole economic system aggregating over the functioning of the individual economic units'. Explain its importance..... (7)
b) Discuss any two important economic indicators and their role in India's economic growth..... (7)

Q.9. a) Discuss the important principles of Industrial Psychology?….(8)
b) Define and explain the relevance of following concepts in management: attitude, morale, values….(6)

Q.10. a) 'Business organizations with unmotivated employees often face low productivity and high turnover rates'. Explain the significance of this statement. …(7)
b) Discuss any two theories of motivation and their relevance to management……..(7)