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B.TECH.
(SEM V) THEORY EXAMINATION 2022-23
INTEGRATED CIRCUITS

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief. 2x10 = 20

- (a) Explain the role of capacitor used in IC 741.
- (b) Define Slew rate and write the value of slew rate for IC 741.
- (c) List the advantages of instrumentation amplifier.
- (d) Calculate the quality factor if the center frequency and bandwidth are **1 KHz, 50 Hz** respectively.
- (e) Explain astable and monostable multivibrators.
- (f) Discuss the uses of voltage follower or voltage buffer.
- (g) Define noise margin and propagation delay.
- (h) Explain the PUN and PDN in CMOS realization.
- (i) Define Lock range and capture range.
- (j) EXOR gate can be used as phase detector. Justify the statement.

SECTION B

2. Attempt any three of the following: 10x3 = 30

- (a) Calculate the voltages and currents of various transistors for input stage of IC 741 after completing the DC analysis.
- (b) Derive all the transfer functions obtained in KHN or universal active filter.
- (c) Discuss the temperature compensation of logarithmic amplifier along with the circuit and mathematical expressions.
- (d) Realize the single-bit comparator using CMOS.
- (e) Explain the working of PLL with its block diagram. Also discuss the various applications of it.

SECTION C

3. Attempt any one part of the following: 10x1 = 10

- (a) Calculate the various parameters like input impedance, output impedance, voltage gain, transconductance for output stage of IC 741.
- (b) Calculate the overall voltage gain provided by IC 741 after drawing the small signal models of each stage.

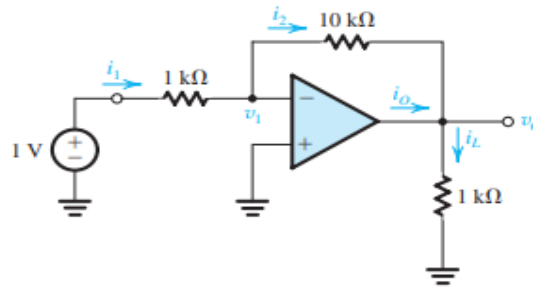
4. Attempt any one part of the following: 10x1 = 10

- (a) Discuss and design a second order band pass filter of bandwidth **100 Hz** and quality factor of **20** with pass band gain of **10**.
- (b) Derive of impedance offered by generalized impedance converter. Also calculate the values of resistances and capacitors to simulate an inductor of **1 mH** using it.

5. Attempt any *one* part of the following:

10x1 = 10

- (a) Discuss analog multiplier along with its quadrant operation. Also explain the various applications of it.
- (b) For the following circuit calculate the $i_1, i_2, i_o, i_L, v_1, v_o$. Also calculate the voltage gain, input resistance, current gain and power gain.



6. Attempt any *one* part of the following:

10x1 = 10

- (a) Realize R S flip flop using CMOS inverter. Also discuss its simplified and clocked implementation.
- (b) Discuss the D flip flop implementation using CMOS. Also explain its master slave configuration.

7. Attempt any *one* part of the following:

10x1 = 10

- (a) Using 555 timer discuss the operation of monostable multivibrator. Also design a pulse generator of pulse width of 1 ms using it.
- (b) Explain the working of VCO with its block diagram and necessary waveforms and mathematical expressions.