



13. a) Briefly explain the operation of CMOS inverter. [5]  
 b) Compare the various digital integrated circuit logic families. [5]
14. a) Draw the different topologies in a negative feedback amplifier. Explain the effect of feedback on the input and output impedances in each case. [5]  
 b) Draw the circuit diagram of Colpitts oscillator. Derive the expression for its frequency of Oscillation. [5]
15. a) Explain the operation of op-amp as current controlled voltage source. [5]  
 b) Briefly explain the operation of op-amp as instrumentation amplifier. [5]
16. a) A bridge rectifier with capacitor filter is fed from 220V to 40V step-down transformer. If average dc current is load is 1A and capacitor filter of  $800\mu\text{F}$ , calculate the load regulation and ripple factor, assume power line frequency of 50Hz. Neglect diode forward resistance and dc resistance of secondary of transformer. [5]  
 b) Why self bias circuit is preferred than other biasing circuits? Derive the expression for stability factor of self bias circuit. [5]
17. Answer any *two* of the following:  
 a) CMOS-NAND implementation [5]  
 b) Draw the RC-phase shift oscillators and derive its frequency of oscillation. [5]  
 c) Op-amp as a Analog multipliers [5]

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