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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular / Supplementary) - May, 2019

**Regulation: IARE – R16**

## DIGITAL AND PULSE CIRCUITS

**Time: 3 Hours**

**(EEE)**

**Max Marks: 70**

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

### UNIT – I

1. (a) Write short notes on binary number systems. Discuss 1's and 2's complement methods of subtraction. [7M]
- (b) i) Subtract 14 from 46 using 8 bit 2's complement arithmetic
- ii) Add -75 to +26 using 8 bit 2's complement arithmetic [7M]
2. (a) Differentiate between BCD code and 2421 code and excess-3. [7M]
- (b) Express the Boolean function  $F = A + B'C$  as standard sum of min terms. [7M]

### UNIT – II

3. (a) State and prove the following Laws. [7M]
  - i) Demorgan's theorem
  - ii) Distributive law
- (b) Simplify the boolean function using 5 variable K-Map [7M]  
 $F(A, B, C, D, E) = \sum m(0, 2, 4, 6, 9, 13, 21, 23, 25, 29, 31)$ .
4. (a) Design a combinational circuit to produce 2's complement of a 4-bit binary number. [7M]
- (b) Implement the following boolean function with a  $8 \times 1$  multiplexer. [7M]  
 $F(A, B, C, D) = \sum m(0, 3, 5, 6, 8, 9, 14, 15)$ .

### UNIT – III

5. (a) Define Latch. Explain about different types of Latches in detail. [7M]
- (b) Draw the circuit of JK flip-flop using NAND gates and explain its operation. Convert D flip-flop to SR flip-flop. [7M]
6. (a) Explain with the help of a block diagram, the basic components of a sequential circuit? [7M]
- (b) Design a mod-10 Asynchronous counter using T flip-flops. Design a mod-6 Synchronous counter using JK flip-flops. [7M]

### UNIT – IV

7. (a) Explain the advantages and disadvantages of negative feedback. Draw and explain RC phase shift oscillator. [7M]
- (b) An amplifier has a voltage gain of 400,  $f_1=50\text{hz}$ ,  $f_2=200\text{KHz}$  and a distortion of 10% without feedback. Determine the amplifier voltage gain and pf when a negative feedback is applied with feedback ratio of 0.01? [7M]
8. (a) Write the frequency of oscillation for Colpitts's oscillator? What are the limitations of Colpitts's oscillator? [7M]
- (b) A crystal oscillator has the following parameters:  $L=0.5\text{H}$ ,  $C_s=0.06\text{pF}$ ,  $C_p=1.0\text{pF}$  and  $R=5\text{ k}\Omega$ .
- i) Find the series resonant frequency [7M]
- ii) Find Q of the crystal

### UNIT – V

9. (a) Draw the circuit of a CE amplifier with an emitter resistance, and derive the expression for input impedance, output impedance, current gain and voltage gain. [7M]
- (b) A transistor used in self-bias CE amplifier connection has the following set of h-parameters,  $h_{ie}=1.1\text{k}\Omega$ ,  $h_{fe}=50$ ,  $h_{re}=2.5\times 10^{-4}$ ,  $h_{oe}=25\times 10^{-6}\text{A/V}$ ,  $R_1=100\text{k}\Omega$ ,  $R_2=10\text{k}\Omega$ ,  $R_C=5\text{k}\Omega$ ,  $R_E=1\text{k}\Omega$ ,  $R_S=10\text{k}\Omega$ ,  $R_L=5\text{k}\Omega$ . Determine input impedance, output impedance, current gain and voltage gain. [7M]
10. (a) Why CC is called emitter follower and justify? Deduce the equations for voltage gain, current gain, input impedance and output impedance for a BJT using the approximate hybrid parameter models for CC configuration. [7M]
- (b) A CC amplifier is driven by voltage source with internal resistance  $R_s=800\Omega$ . The load impedance  $R_L=2\text{k}\Omega$ . The h-parameters are  $h_{ic}=1.1\text{K}\Omega$ ,  $h_{rc}=1$ ,  $h_{fc}=-51$ ,  $h_{oc}=25\mu\text{A/V}$ . Compute  $A_I$ ,  $A_V$ ,  $A_{I_s}$ ,  $R_i$ ,  $Z_o$  &  $A_p$ . [7M]

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