B.Tech. Degree III Semester Regular/Supplementary Examination in Marine Engineering December 2021

19-208-0304 MARINE ELECTRONICS
(2019 Scheme)

Time: 3 Hours   Maximum Marks: 60

(5 × 15 = 75)

I. (a) Draw the circuit of transformer coupled configuration of Class A power amplifier and derive the expressions for collector efficiency. (7)

(b) What is crossover distortion? How it is eliminated using complementary symmetry class AB biased push pull Amplifer? Draw neat diagram and explain its working. (8)

OR

II. (a) Explain opamp as noninverting amplifier along with circuit diagram, and derive the expression for voltage gain. (5)

(b) An inverting amplifier has Rf = 500 k Ω and R1= 5 k Ω and input voltage of 0.1 V pp. Draw the inverting amplifier diagram and determine the amplifier circuit voltage gain, input resistance, output voltage (peak to peak), maximum operating frequency if slew rate is 0.5 v/μs. (5)

(c) Draw the circuit of a differentiator using opamp and derive the expression for output voltage. (5)

III. (a) What are weighted and non weighted BCD codes? Compare the features of 8421 code and Excess three (XS-3) code with any 2 respective code patterns of decimals. (5)

(b) Reduce following boolean function using K MAP
$$F(A,B,C,D) = \Sigma m(0,1,2,5,7,8,9,10,13,15)$$ (6)

(c) Realize XOR function using NAND gate along with necessary Boolean algebra minimization. (4)

OR

IV. (a) What is race around condition? How it is avoided in J K Flipflop. (4)

(b) Expand $\overline{A} + \overline{B}$ to min terms and maxterms. (5)

(c) Design a MOD 10 Asynchronous counter using T flipflop along with its truth table. (6)

V. (a) Draw architecture of 8085 microprocessor and explain the significance of each block. (10)

(b) Draw neat circuit diagram and explain the working and applications of any one type of ADC. (5)

OR

VI. (a) Write an 8085 microprocessor assembly language program (along with algorithm and necessary comments) for BINARY DIVISION. The divisor is stored in memory location 4151H, dividend is stored in 4152H. The reminder and quotient should be stored in 4153H and 4154H respectively. (6)

(b) Draw neat circuit diagram and explain the working and applications of any one type of DAC. (5)

(c) Draw the flag register of 8085 microprocessor, label the flags and give its status after any arithmetic or logical operation. (4)

VII. (a) Along with neat diagram, describe the working of   (10)
           (i)   TTL NAND gate
           (ii)   CMOS NOR gate

      (b) Compare the semiconductor memories RAM, ROM and PROM.   (5)

OR

VIII. (a) The gate current in a thyristorised full wave rectifier is adjusted to 1.2 mA   (7)
and the forward breakdown voltage of SCR corresponding to this gate current is 150 V. The applied voltage is a sinusoidal voltage of 300 V peak, the load resistance is 100 Ω and the holding current is zero. Determine:

           (i)   firing angle
           (ii)   conduction angle
           (iii)   average output voltage
           (iv)   average current
           (V)   power output

      (b) A Single Phase Half-Wave Controlled Rectifier with R-L Load is supplied   (8)
from a 230V, 50Hz source. For R-L load with extinction angle β equal to π + α, where α is the firing angle, plot the output voltage and current waveforms. Draw the output voltage and current if free- wheeling diode is connected across the load.

IX. (a) Define Modulation Index. With the help of waveform, derive and explain   (6)
the modulation index of an AM wave.

      (b) Draw the block diagram of FM super heterodyne receiver and explain its   (6)
working principle.

      (c) A carrier wave of 400 watts is subjected to 80% amplitude modulation.   (3)
Determine:

           (i)   power in sidebands

           (ii)   power of modulated wave

OR

X. (a) With the help of waveforms explain the three analog pulse modulation   (7)
techniques briefly and give its comparison and applications.

     (b) Write the principle of Radar Communication. Explain the functional block   (8)
diagram of a pulsed radar system.

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