SARDAR PATEL UNIVERSITY
M.Sc. (Physics) (Ist Semester) Examination
Friday, 26/10/2018, Time: 10:00 a.m. to 01:00 p.m.
Subject: ANALOG AND DIGITAL ELECTRONICS
Paper No. : PS01CPHY23

Instruction:

Figures to the right indicate marks.   **Total Marks : 70**

Q.1 **Write answer of all questions by showing your choice against the question number.**   **[8]**

(i)   Which of the following PN junction diode parameters is considered for a diode to operate at high frequency?

(a) Ideality factor,   (b) Series resistance,

(c) Band gap,   (d) Reverse recovery time.

(ii) Which of the following devices display the I-V characteristics passing through three quadrants?

(a) PN junction diode, (b) UJT, (c) Solar Cell, (d) LED

(iii) Which of the following Op-Amp parameters reduces the loading effect for applied input signal?

(a) Voltage Gain, (b) Slew Rate, (c) Input Impedance, (d) Output Impedance

(iv) The power supply rejection ratio of an Op-Amp is expressed in terms of

(a) dB,   (b) μV / V,   (c) Input Impedance, (d) Output Impedance

(v)   In certain four variable Karnaugh map, a quad eliminates____ variables and their complements.

(a) 2,   (b) 3,   (c) 4,   (d) 1

(vi) Which of the following digital circuit is used to select one of many input data lines to appear at the output on applying proper select input signals?

(a) Decoder,   (b) Encoder,   (c) Multiplexer,   (d) De-Multiplexer

(vii) How many data inputs and data outputs are required for a 32Kx12 memory?

(a) 4   (b) 8,   (c) 32,   (d) 12

(viii) The role of an Op-Amp in a binary ladder type digital to analog comparator is to provide_____

(a) resistive divider network, (b) voltage follower circuit, (c) voltage multiplier circuit, (d) inverting amplifier circuit.

Q.2 **Attempt any Seven of the followings:**   **[14]**

(i)   Explain the differences between photodiode and LED.

(ii) Define the intrinsic stand-off ratio of UJT. On what parameters does it depend?

(iii) A certain monostable multivibrator circuit constructed using IC-555 is connected to external resistor of 10kΩ and capacitor of 0.1μF. Find out the pulse width (ON time) of the output waveform.

(iv) Draw the circuit diagram of Voltage Controlled Oscillator (VCO) using IC - 741 and discuss its working in brief.

(v)   Differentiate between sequential and cyclic binary codes.

(vi) Convert the Gray code 1101 to Excess three code.

(vii) Write advantages and limitations of synchronous counters.

(viii) Define volatile and non-volatile semiconductor memory and mention their applications.

(ix)   Sketch the weighted-resistor type DAC circuit and write the equation of its output voltage.

Q.3(a)   With necessary circuit diagram and waveforms explain the working of diode [6] clamper circuits. Further draw the circuit for clamping lower level of the input wave form to approximately +2V.

Q.3(b)   Explain the working of solar cell with necessary equation and show why the dark [6] V-I characteristic moves into the 4th quadrant when the cell is illuminated.

OR

Q.3(b)   Explain with block diagram and necessary equivalent circuit diagram the working [6] of Silicon Control Rectifier (SCR). Mention few of its chief applications.

Q.4(a)   Draw the circuit diagram of non-inverting comparator using IC-741. Discuss its [6] operation in detail with necessary input and output waveforms.

Q.4(b)   Sketch the block diagram of Op-Amp IC-741 and discuss working of each of its [6] blocks.

OR

Q.4(b)   Draw the circuit diagram of an astable multivibrator using IC-555 and discuss its [6] working principle.

Q.5(a)   Discuss in brief about the characteristics features of following BCD codes [6] (i) 8421 , (ii) Excess-3

Q.5(b)   Sketch the circuit diagram of a full adder circuit and explain its working with the [6] help of truth table.

OR

Q.5(b)   What is a buffer register? With the help of logic diagram explain the working of a [6] 4-bit controlled buffer register. Also show different ways by which data transmission takes place using shift registers.

Q.6(a)   With the help of block diagram and output waveform explain the working of a 4-bit [6] digital to analog converter. Also define resolution and settling time of DAC

Q.6(b)   Taking suitable example explain how semiconductor memory expansion is made. [6]

OR

Q.6(b)   Discuss the operation of a counter type ADC with the help of neat diagram and [6] output waveform. Also mention its limitations.

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