19 DCT 2019

M.Sc. Physics Examination

Phys C-104: Electronics: Digital and Op-amp

Paper Code: 4515

Duration: 2.30 Hour Total Marks: 70 Q.1 (A) (i) What is magnitude comparator? Write detailed note on 4-bit magnitude comparator [8] using logic diagram and Boolean expressions for each conditions. Explain it with an example. Draw logic diagram of keyboard encoder. Explain it with an example. [6] (ii) OR (A) (i) Write detailed note on shift register. What is bidirectional shift register? Explain it [8] with logic diagram and an example. Also draw function/truth table. Determine the output waveforms Q1, Q2, [3] (ii) D1 and D2 of this circuit when the Clock input is applied as square wave. Initially all the flip flops are in reset state. (iii) What are the T-flip flops and D-flip flops? How they are realized? [3] (B) Attempt any four questions. Define propagation delay time of flip flop. (i) [1] (ii) On which principle does the parity generator work? [1] (iii) Draw logic diagram of 2-input multiplexer. [1] (iv) What is data selector? [1] Define hold time of flip flop. [1] (vi) How many bytes are required for storing 1kBytes? [1] (a) 1000, (b) 1024, (c) 1064, (d) 10.00,000 Q.2 (A) (i) Describe the term "digital counter". Design and implement mod-10 asynchronous [8] counter using logic diagram, block diagram and function table. Explain edge triggered SR flip flop in detail. Also draw timing diagram. [6] (ii) OR (A) (i) Explain operation of universal shift register in detail. [10] (ii) Write flip flop operating characteristics. [4] (B) Attempt any four questions. (i) What are preset and clear inputs in flip flop? [1] How can a SR flip flop be converted into a D flip flop? [1] (ii) If clock is square wave with frequency 4 khz and S and R inputs are also square [1] waves with frequencies 2 kHz and 1 kHz respectively. Draw timing diagram of output waveform of SR flip flop. (iv) What is meant by stable state? [1] What is toggling? [1] (vi) What does the triangle symbol of clock in a flip-flop means? [1] Q.3 (A) (i) Derive formula for gain of first order low pass filter and explain it. Draw its [10] frequency response.

What is second order filter? How does it differ from first order filter? Discuss roll-off [4] (ii) rate for both of them. OR Classify oscillators according to different categories. Design Wien bridge oscillator (A) (i) [8] with oscillating frequency of 1kHz. Explain its working. Classify filters. Where are the electronic filters used? Give examples. [4] (iii) What is the flat-flat filter? [2] (B) Attempt any three questions. The absolute gain of an amplifier is 40; find its gain in decibel. (i) [1] (ii) What is the difference between active component and passive component? [1] What type of filter produces a predictable phase shift characteristic in all [1] frequencies? a) Band pass filters b) High pass filters c) Low pass filters d) All pass filters (iv) What is a filter? [1] a) Frequency selective circuit b) Amplitude selective circuit c) Frequency damping circuit d) Amplitude damping circuit What is "Bandwidth"? (v) [1] Q.4 (A) (i) Implement an astable multivibrator using IC 555 as. Explain its working. [6] In a 555 multi-vibrator circuit let $R_A=1.2 \text{ k}\Omega$, $R_B=6.8 \text{k}\Omega$ and C=0.05 uF. Determine [4] the positive pulse width and free running frequency fo. (iii) Design a comparator as Schmitt trigger with Vin=1V pp sine wave and upper [4] threshold voltage and lower threshold voltage be +/- 2 V, the op-amp is 741 with power supply=+ 15V. Calculate the component values to be used. OR Explain voltage regulator. Classify regulators. Explain and design adjustable voltage (A) (i) [8] regulator using IC LM317 for Vout=13.6V. Write characteristics and limitations of op-amp as basic comparator. [6] (B) Attempt any three questions. (i) What is load regulation? [1] (ii) What is frequency stability of an op amp? [1] (iii) Zero crossing detector is also known as [1] a) Square to sine wave generator b) Sine to square wave generator c) Sine to triangular wave generator d) All of the above mentioned (iv) Which A/D converter is considered to be simplest, fastest and most expensive? [1] a) Servo converter b) Counter type ADC c) Flash type ADC d) All of the mentioned A circuit that can change the frequency of oscillation with application of DC voltage [1] is called: (a) Voltage Controlled Oscillator, (b) Crystal Oscillator (c) Hartley Oscillator, (d) Astable Multivibrator