

**II B.Tech I Semester Regular Examinations, November 2006**  
**INSTRUMENTATION COMPONENTS**  
**(Electronics & Control Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Explain the Basic principle of Mechanical Linkages.  
(b) Illustrate a mechanical system using linkages. [8+8]
2. (a) What is the need for a valve  
(b) When are they installed?  
(c) Give typical design guidelines for diaphragms. [4+4+8]
3. (a) Differentiate between a potentiometer and a rheostat.  
(b) What is the difference between voltage and current transducers.  
(c) Mention two uses of each of current and voltage transducers. [6+6+4]
4. (a) Derive the expression for the transfer function of a field control dc motor.  
(b) Explain the working of a dc servomotor with a neat sketch.  
(c) Mention atleast two used of servomotors as control element. [6+6+4]
5. Explain briefly, the basic construction of the following resistors.  
(a) Variable wire wound resistor  
(b) Potentiometer  
(c) Trimmers. [6+5+5]
6. (a) List the parameters of IC741 and explain the significance.  
(b) Explain 741 IC as a summing and difference amplifier. [8+8]
7. (a) Explain how light energy is converted into electrical energy in photo detector?  
(b) What are the materials used for manufacturing light dependent resistor? Explain the process briefly.  
(c) Explain how a photodiode can be used in an alarm system. [4+6+6]
8. (a) Discuss the spectral transmittance characteristics of an absorption filter.  
(b) What are the parameters to be observed in the design of grating.  
(c) Give two types of mounting of grating and explain the importance of mount in the grating. [6+4+6]

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1. (a) Discuss the merits and demerits of Chain and Friction drives. [2+2+2+2]  
(b) Mention application of chain and friction drives indicating the preference of one over the other in specific system. [4+4]
2. (a) How do diaphragms fit in as control components. [6]  
(b) Explain in detail about the construction and working principles of diaphragm. [5+5]
3. (a) What is the difference between a switch and a relay? [4]  
(b) Explain the working of a electromechanical relay with a neat sketch and give the applications. [4+4+4]
4. A stepper motor driven by bipolar drive circuit has the following parameters.  
Winding inductance (average) = 30mH  
Rated current = 5A  
Total resistance in each phase = 15 ohms  
D.C supply = 45V  
When transistors are turned off, determine the  
(a) Time taken by the phase current to decay to zero.  
(b) Proportion of the stored inductive energy returned to the d.c supply. [8+8]
5. Write short notes on the following with respect to PN diode.  
(a) Static resistance  
(b) Dynamic resistance  
(c) Reverse resistance  
(d) Barrier capacitance. [4+4+4+4]
6. (a) With a typical connection diagram explain the circuit operation of the adjustable positive voltage regulator LM317.  
(b) Design an adjustable voltage regulator using LM317 to satisfy the following condition: Output voltage  $V_0 = 5$  to 12V Output current  $I_0 = 1A$ , Adjustment pin current ( $I_{adj}$ ) for LM317 = 100 $\mu A$ . [10+6]
7. (a) What is the essential difference between principle of operation of normal p-n diode and a LED.

- (b) Describe the working principle of light emitting diode with neat diagram.
  - (c) Draw the schematic representation of an optocoupler and explain its working principle. [4+6+6]
8. (a) Discuss the spectral transmittance characteristics of an absorption filter.
- (b) What are the parameters to be observed in the design of grating.
  - (c) Give two types of mounting of grating and explain the importance of mount in the grating. [6+4+6]

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1. Write short notes on:

- (a) Flat pivot
- (b) Flat collar pivot
- (c) Conical pivot.

2. (a) What is the need for a valve

(b) When are they installed?

(c) Give typical design guidelines for diaphragms. [4+4+8]

3. (a) What is the difference between a switch and a relay? [4]

(b) Explain the working of an electromechanical relay with a neat sketch and give the applications. [4+4+4]

4. (a) What is a multistep stepper motor? [4]

(b) Describe the working of a multistep stepper motor with neat diagram. [4+4]

(c) Mention two uses of stepper motor. [4]

5. (a) Explain the construction and working principle of SCR.

(b) Draw two transistor for representation of SCR and also explain its V-I characteristics. [8+8]

6. (a) With the help of functional diagram and circuit diagram explain the monostable operation of 555 timer.

(b) Derive the expression for time delay of a monostable multivibrator. [10+6]

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(b) Describe the working principle of light emitting diode with neat diagram.

(c) Draw the schematic representation of an optocoupler and explain its working principle. [4+6+6]

8. (a) Discuss the spectral transmittance characteristics of an absorption filter.

(b) What are the parameters to be observed in the design of grating.

(c) Give two types of mounting of grating and explain the importance of mount in the grating. [6+4+6]

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1. (a) Explain automobile clutch mechanism?  
(b) Differentiate belt and chain drives? [8+8]
2. (a) Discriminates between properties and interval and differential control as applied to control systems.  
(b) Explain the working principles of derivative and integral action of pneumatic controller. [8+8]
3. (a) Explain how a potentiometer can be used as a control component in servo control system.  
(b) Explain in detail the various characteristics of potentiometer. [8+8]
4. (a) Sketch the block diagram of a servo system using two phase motor and derive its transfer function. [4+4]  
(b) What will be the response of the system for step input. [8]
5. (a) List the different types of windings that are employed in inductors.  
(b) List the factors affecting the capacitance of capacitors.  
(c) Explain the terms electrical noise, power derating and Boells effect of resistors.  
(d) Explain the colour code for resistors. [4+4+4+4]
6. (a) Draw the block diagram of 555 Timer and explain the function of each block.  
(b) List the applications and specifications of 555 IC  
(c) Draw the cut diagram of a astable using 555 timer. [6+4+6]
7. (a) Explain the principle of working of a photodiode.  
(b) Give the construction details of a photodiode and explain its working.  
(c) Show how a photodiode be used as a photo detector. [6+6+4]
8. (a) Draw the cross sectional diagram of a reflection grating. Explain.  
(b) What are the different types of resonators used in Instrumentation system? Explain any one. [8+8]

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