

**N.B. :** (1) Question No. 1 is compulsory.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) Assume **suitable** data wherever **required** but clearly **state** and **justify** it.

(4) **Figures** to the **right** indicate **full** marks.

1. Solve the following :- 20
  - (a) Explain different types of pump systems.
  - (b) What is range sensor ? And give its applications.
  - (c) What is microsensor ? Give the basic fabrication process steps of microsensor.
  - (d) Explain mechatronics system with its key elements.
  
2. (a) Explain the construction of permanent magnet stepper motors. Derive motor 10 equations and draw the block diagram model of PM stepper motor.
- (b) A force of cantilever beam is to be measured, draw the system diagram and block 10 diagram model. Explain hardware / software needed to implement hardware in loop of this system.
  
3. (a) Draw the ladder rungs to represent - 10
  - (i) Two switches are normally open and both have to be closed for a motor to operate
  - (ii) Either of two normally open, switches have to be closed for a coil to be energized and operate an actuator
  - (iii) A motor is switched ON by a spring return push button start switch and the motor remains ON until another spring return push button stop switch is pressed.
- (b) Explain in detail mechatronics design process with its block diagram, operation and 10 importance.
  
4. (a) Explain various properties of sensors. 5
- (b) Write the fundamental laws, which are used in most mechatronics applications 5 involved rigid body system.
- (c) What is adaptive control system, compare the performance of different types of 10 adaptive control systems.

5. (a) Explain the following terms :- 10
- (i) Hydraulic resistance
  - (ii) Hydraulic capacitance
  - (iii) Pneumatic inertance
  - (iv) Thermal capacitance
  - (v) Damper model.
- (b) Explain the basic function of various component of Data Acquisition and Control systems. 5
- (c) What are different applications of fiber optic devices in mechatronics ? 5
6. (a) Explain the block diagram of PLC with its selection criteria. 10
- (b) Write the steps involved in the installation of I/O cards and software. 5
- (c) Explain brushless DC motor. 5
7. Write short notes on the following :- 20
- (a) Components of Data Acquisition and Control System
  - (b) Hardware-in-loop simulation
  - (c) Control system design techniques.
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Instructions to the candidates:

- 1) Question number 1 is compulsory
  - 2) Attempt any 4 questions from remaining 6 questions
  - 3) Draw necessary figures or sketches wherever required
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- Q1 (a): Differentiate between fixed and flexible automation. (20)
- (b): Explain various kinematic parameters with neat diagram.
- (c): Differentiate between Direct Kinematics, Inverse Kinematics.
- (d): What is trajectory planning?
- Q2 (a): Explain various technical specifications of the robots. (20)
- (b): Explain steps of the DH Algorithm in Direct Kinematics of 3 axis robot.
- Q3 (a): Why the Inverse Kinematics solutions are not unique? State and explain various properties of Inverse Kinematics solutions. (20)
- (b): Explain Gravity Fed Part Feeder, Conveyors & Corousels with neat diagrams.
- Q4 (a): With respect to pick and place trajectory, explain pick-up point, lift-off point, set-down point and place point. State where gross motion and fine motion observed on this trajectory. (20)
- (b): Explain various template matching techniques.
- Q5 (a): Explain Generalized Voronoi Diagram (GVD) and the configuration space methods of gross motion planning. (20)
- (b): Explain the effect of moment of inertia on the dynamic performance of the robot arm.
- Q6 (a): Explain the Bounded Deviation Algorithm (BDA) for obtaining a straight line motion. (20)
- (b): Explain the perspective transformation and inverse perspective transformation.
- Q7: Write short notes on: (20)
- (a): Euler number and its use in image processing.
- (b): Tool Configuration Vector (TCV) and its significance in IK solutions
- (c): Screw transformation
- (d): Applications of the robots
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B.E VIII Old ETRX  
Data Comm & N/W

13/5/13

8 : 1st half.13-shilpa(i)

Con. 7818-13.

(OLD COURSE)

GS-1924

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions out of remaining **six** questions.  
(3) **Figures** to the **right** indicate **full** marks.  
(4) Assume **suitable** data wherever **necessary**.

1. (a) What are the transmission impairments ? Explain in brief. 5  
(b) Compare stop and wait flow control with sliding window flow control. 5  
(c) Distinguish between ATM and Frame relay. 5  
(d) Explain CSMA / CD protocol. 5
2. (a) Explain ADSL in detail. 10  
(b) Sketch HDLC frame structure. With respect to it explain :- 10
  - (i) Piggy backing
  - (ii) Data Transfer modes
  - (iii) Types of frames
  - (v) Bit stuffing.
3. (a) Draw and explain ATM cell format. 10  
(b) Explain Bellman Ford algorithm with an example. 10
4. (a) Discuss datagram packet switching in detail. 10  
(b) Compare synchronous TDM with statistical TDM. Describe briefly about digital carrier standards. 10
5. (a) Describe common channel signalling and SS7 signalling system. 10  
(b) Explain ISDN with the help of :- 10
  - (i) Architecture and
  - (ii) ISDN channels.
6. (a) Give the physical layer specifications of different types of IEEE 802.3 10 Mbps and IEEE 802.3 100 Mbps. 10  
(b) Explain OSI model giving functions of each layer. 10
7. Write short notes on any **three** of the following :- 20
  - (a) Congestion control
  - (b) Blocking in circuit switched networks
  - (c) Flooding in packet switched networks
  - (d) IEEE 802.5 token ring protocol.

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8/5/13

B.E. ETRX VIII @ 14)

1st Half-13-Mina - (c)-27

Con. 7989-13.

Power Electronics GS-1708

(OLD COURSE)

(3 Hours)

[ Total Marks : 100

- N. B. :** (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions from the **remaining** questions.  
(3) Illustrate answers with **sketches** whenever **required**.  
(4) **Figures** to the **right** indicate **full** marks.  
(5) Assume **suitable** data if **necessary**.

1. Answer any **four** :— 20
- (a) Draw and explain V-I characteristics of UJT. Explain negative resistance region.
  - (b) State and explain different triggering circuits.
  - (c) Explain need of cooling of a power device in details.
  - (d) Explain the constant torque region and constant power region in IM torque-speed characteristics.
  - (e) Draw and explain stepup chopper.
  - (f) Explain the function of feedback diodes used in antiparallel with transistors in inverters. Draw and explain Bridge Inverter.
2. (a) What is synchronization ? Draw and explain half wave controlled rectifier with resistive load triggered using UJT relaxation oscillator. 10
- (b) Explain the ac power control circuit. Which two modes of TRIAC are used in the ac power control circuit ? Explain. 10
3. (a) Draw and explain series inverter circuit. State and explain its limitation and how it is modified. 10
- (b) Draw and explain auxiliary commutated single phase bridge inverter using some suitable voltage and current waveforms. 10
4. (a) Draw and explain load commutated chopper. Explain how it is different from voltage commutated chopper. 10
- (b) With the help of voltage and current waveforms, explain the working of first quadrant chopper. Give the completed time domain analysis of class A chopper. 10
5. (a) Explain the performance parameter of single phase fully controlled bridge rectifier feeding with active load. Draw the necessary waveforms. 10
- (b) Draw the neat diagram for 3-phase full converter feeding highly inductive load. Assuming continuous and ripple free output current. Draw the output voltage waveforms for  $\alpha = 30$  degree measured from natural angle delay i.e.  $\pi/6$  clearly show the conducting sequence of devices. 10

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6. (a) Explain the rotor resistance control of IM. Draw and explain Speed-Torque and Speed-rotor current curves of a wound rotor motor. **10**
- (b) Explain the Harmonic loads and causes. **10**
7. Write short notes on any **four** :— **20**
- (a)  $dv/dt$  rating,  $di/dt$  rating and its protection circuit.
  - (b)  $v/f$  control of Induction motor.
  - (c) Effect of source inductance on output voltage of FWCR.
  - (d) Sine Triangle PWM method.
  - (e) Second Break down in case of power transistor.
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