ws Mrach-2012 194

Con. 3878-12.

(OLD COURSE)

GN-5867

(3 Hours)

[**Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
  (2) Attempt any **four** questions from remaining **six** questions.
  (3) Assume **suitable** data if **required**.
  (4) **Figures** to the **right** indicate marks.

1. Answer the following :—
  (a) Explain the IGBT characteristics with its operation. **5**
  (b) The maximum temperature of thyristor is 150°C. The thermal resistance for **5** thyristor-sink combination is 0·0015°C/W and 0·08°C/W. Determine the total average power loss in this combination if heat sink temperature is 60°C. If the heat sink temperature is reduced to 50°C by forced air cooling, find the percentage increase in the device rating.
  (c) Give the comparision between Half controlled converter with full controlled **5** converter.
  (d) Draw neat circuit diagram of single phase semiconverter for armature voltage **5** control with necessary waveforms.

2. (a) Explain the turn-on and turn-off characteristics of the thyristor. **10**
  (b) Explain the operation of A.C. phase control using Diac-Triac for lamp dimmer **10** application. Draw the voltage waveforms at
   (i) a.c. supply (ii) across capacitor (ii) Triac (iv) load.

3. (a) Explain the soft start and soft stop control circuit used in motor control application. **10**
  (b) Design the R.C snubber circuit used to provide dv/dt protection in single phase **10**

   bridge rectifier. The SCR has $\left.\dfrac{dv}{dt}\right|_{max} = 60\,V/\mu sec.$ The input line to line voltage

   has peak value of 425 volts and the source inductance is 0·2 mH.

4. (a) Explain the operation of three phase fwc with resistive load. Sketch all associated **10** waveforms.
  (b) Derive an expression for performance parameters factors of 1-ϕ half controlled **10** convertor circuit.

5. (a) With the help of neat diagram and waveforms, explain the operation of series inverter. **10**
  (b) Compare (i) CSI and VSI (ii) Single PWM and multiple PWM. **10**

6. (a) Derive an expression for average and rms value of the load voltage for step-down **10** chopper having R-L load.
  (b) Explain the principle of v/f method of speed control. Draw the torque-speed **10** characterstics. What are its advantages.

7. Write short notes on (any **three**) :— **20**
  (a) Micro Controller Based Drives
  (b) Parallel Inverter
  (c) Jones Chopper
  (d) Semiconverter with R-L Load.

Con. 3687-12.

(3 Hours) [Total Marks : 100

N.B. :(1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) Assume **suitable** data wherever **required**.

1. (a) What are the transmission impairments ? Explain each briefly. **5**
(b) What are the three types of frames supported by HDLC ? Describe each in detail. **5**
(c) Distinguish between Circuit switching and Packet switching. **5**
(d) Compare frame relay and ATM. **5**

2. (a) Draw HDLC frame format. Explain each frame in detail. Also explain : **10**
(i) Data transparency (ii) Data transfer modes in HDLC.
(b) A CRC is constructed using the CRC-16 polynomial. Determine the CRC if data **10**
bit sequence is 1010101010101. Also draw shift register circuit for the same.

3. (a) Define utilization or efficiency of the line and derive the expression for— **14**
(i) Stop and wait flow control.
(ii) Sliding window flow control.
(b) Calculate the throughput efficiency for the stop and wait flow control mechanism, **6**
if the frame size is 4800 bits, bit rate is 9600 bps and distance between the
two devices is 2000 km. Speed of propagation over the transmission is
2,00,000 km/sec.

4. (a) What is congestion in a packet switching network ? How to achieve quality of **6**
service ?
(b) Apply Dijkstra's and Bellman-Ford routing algorithm to the network shown below **14**
for source node 1. From the result, develop the tree and routing table for
node 1. Will Dijkstra's algorithm and the Bellman Ford algorithm always yield
the same solution ? Why or why not ?
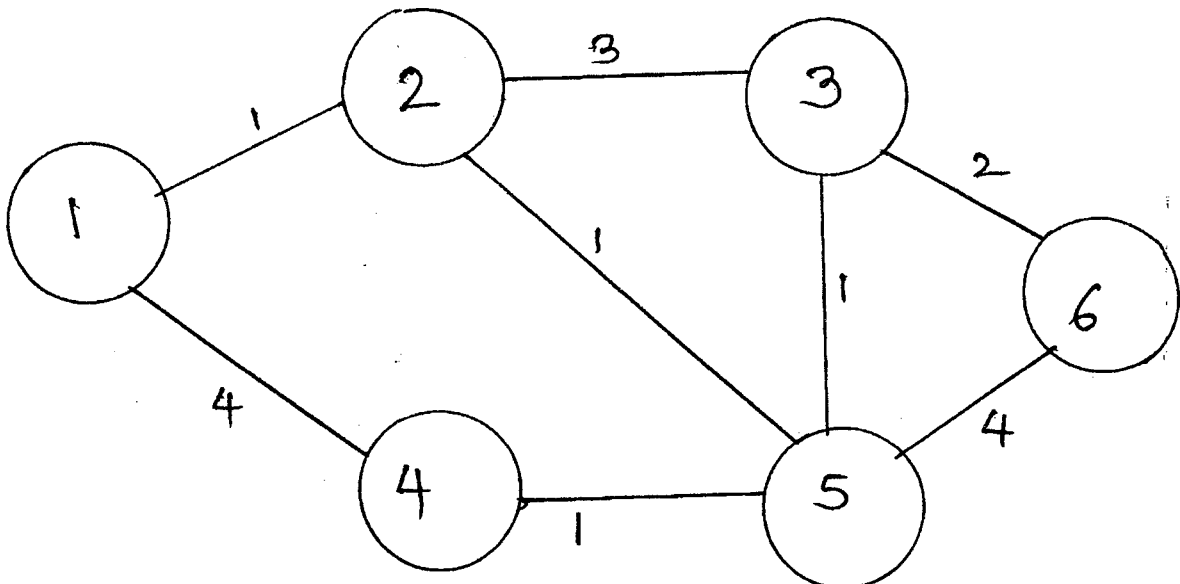
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5. (a) Draw a three stage space division switch for N = 20, n = 5 and k = 2 and estimate   **10**
the number of cross-points required. If the above switch is to be made
non-blocking, derive the expression for the condition to be satisfied, also calculate
the minimum cross-points required for non-blocking.

   (b) With a suitable sketch : explain the connection phases in Point to Point Protocol   **10**
(PPP). State the main features of the Authentication protocols supported by PPP.

6. (a) Explain spanning tree algorithm. Consider the topology of a bridged LAN as   **10**
shown below : The bridges are designated by B_1, B_2..... and each port ID is
indicated. The cost assigned to each LAN is equal. Choose B_1 as root bridge.
Show the forwarding and blocking ports after applying spanning tree procedure.
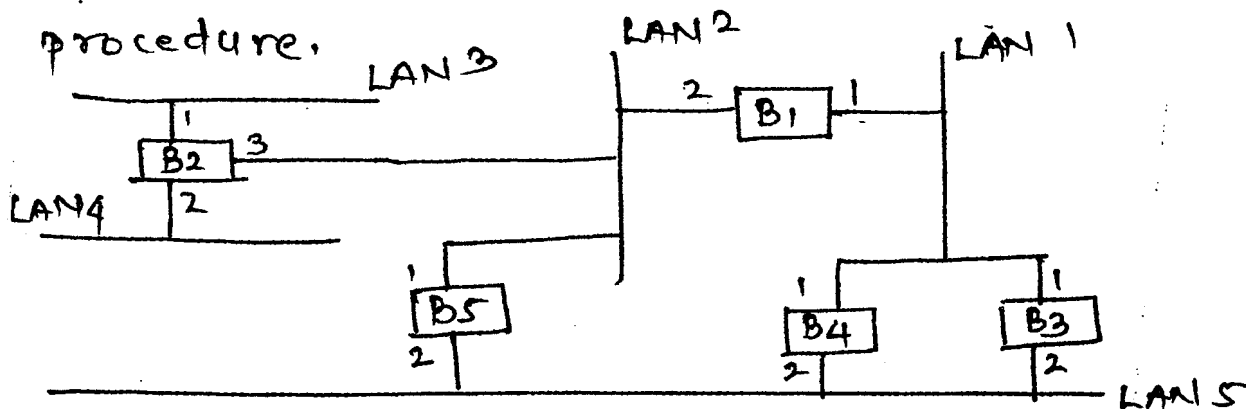
   (b) Give the physical layer specifications of different types of IEEE 802·3 10 Mbps,   **10**
IEEE 802·3 100 Mbps LAN.

7. Write short notes on (any **four**) :—   **20**
    (a) FDDI
    (b) Two-dimensional parity check
    (c) DTE-DCE interface
    (d) ISDN user interface
    (e) CSMA/CD.

(OLD COURSE)

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.

1. (a) Discuss robot classification with suitable diagrams. 10
   (b) Define TWE, JSWE and DWE. 5
   (c) Explain soft and hard automations. 5

2. (a) Using D-H algorithm perform direct kinematics analysis for 4 DOF SCARA robot. 15
   (b) Explain CRM algorithm. 5

3. (a) Explain the significance of TCV in their solution of 1K. 5
   (b) Discuss two methods of obtaining 1K solution. 5
   (c) Develop 1K analysis of 3 DOF PARA. 10

4. (a) Explain linear interpolation with parabolic blends. 10
   (b) Define path and trajectory. Explain Gross motion and fine motion. 10

5. (a) Explain line descriptors and area descriptors in detail. 10
   (b) 10

0	0	1	1	0	0
1	1	1	1	1	1
0	0	1	1	0	0

   For the given image calculate area, centroid, first order moments, second order moments and principal angle.

6. (a) Explain the effect of moment of inertia on the dynamic performance of a robot. 10
   (b) Discuss work space fixtures in the robotic cell. 10

7. Write short notes :— 20
   (a) Shrink and Swell operator
   (b) NC and CNC Machines
   (c) Perspective Transformation
   (d) Task Planning.

Con. 4461-12.　　　　　　　　　**(OLD COURSE)**　　　　　　　　**GN-8300**
　　　　　　　　　　　　　　　(3 Hours)　　　　　　　　　**[Total Marks : 100**

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

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

　　　 (3) Assume any **suitable** data wherever **required**. Justify it.

　　　 (4) Answer to questions should be **grouped** and written **together** i.e. all answers to Sub questions of individual questions like question No. **1, 2, 3** etc. should be Answer **done below** the **other**.

　　　 (5) Use **legible** handwriting.

1.　Answer any **four** of the following:–

　　　(a)　What are the key elements of mechatronics ? Explain in brief.　　　　　　　**5**

　　　(b)　Explain varicus controls involved in intelligent supervisory control system.　　**5**

　　　(c)　Give the list of pressure control valves and volume control valves. State　　　**5**
　　　　　 their applications.

　　　(d)　Explain in brief "over framing". How it can be avoided ?　　　　　　　**5**

　　　(e)　Draw the ladder diagram for basic AND OR NOR, NAND and an XOR　　**5**
　　　　　 system.

2.　(a)　Explain the Ziegler and Nichols methods of controller tuning.　　　　　　　**10**

　　　(b)　A three mode controller has K_P as 2, K_I as 0·1/sec. K_D as 1 sec and a set point output of 50%. The error starts at zero and changes at 5%/sec for 2 sec before becoming constant for 3 sec. It then decreases at 2%/sec to zero and remains at zero. What will be the controller output at (i) 0 sec, (ii) 3 sec,　(iii) 7 sec ?

3.　(a)　For a mass-spring damper combination shown in **figure** determine the equation　**10**
　　　　 relating f and x, the equation relating f and y. Draw the impedance and block diagrams.
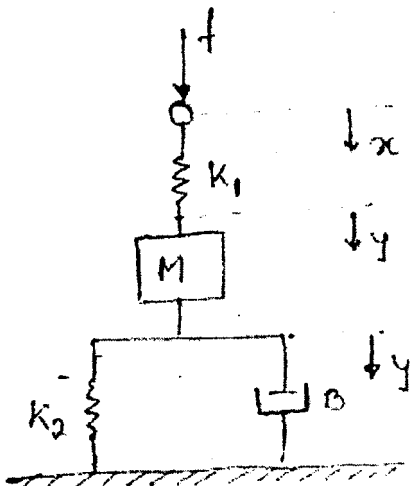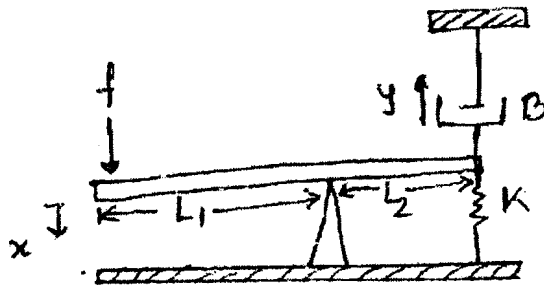

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(b) For the mechanical lever system shown in **figure** below, draw the impedance and block diagram.   **10**

4. (a) Explain in details mechatronics design process diagram, operation and importance.**12**
   (b) Explain the various advanced approaches in mechatronics.   **8**

5. (a) A motor has to be operated in forward and reverse direction by pressing FORWARD **8** And REVERSE push buttons, respectively. The should stop when a stop push button is pressed. There should be an interlock to prevent forward operation when motor is operated in reverse direction and vice versa. Devise a ladder diagram to represent the control sequence.
   (b) Draw and explain the permanent magnet stepper motor principle diagram and derive **12** the motor equation with block diagram model of 4 phase stepper motor.

6. (a) Explain major components of data acquisition and control system.   **10**
   (b) Explain the basic principle of piezoelectric transducer. Derive the expression for **10** voltage. Draw mechanical diagram of piezoelectric accelerometer.

7. (a) Write short notes on :—
      (i) Fuzzy Logic   **5**
      (ii) Micro sensors.   **5**
   (b) Give proportional and integrator compensator design steps. Design PI **10** compensator to modify the behavior of the plant.
   $$G(s) = \frac{1}{s^2 + 9s^2 + 18}$$
   Such that the following performance specifications are met.
      (i) $e_{ss}(step) = 0$, (ii) The system is stable, (iii) $\tau \le 0.5$ sec.