SEAT No._____

No. of Printed Pages : 02

[60]

SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar - 388120

M.Sc. (3rd Sem) Examination - 2017

Instrumentation & Control

PS03CINC01 (Biomedical Instrumentation)

2nd November, 2017 (Thursday)

2:00 PM - 5:00 PM

Maximum Marks: 70

Que 1 Each question below gives a multiple choice of answers. Choose the most appropriate one. [08]

1 _____: Electrical Signal are Generated by Internal Sources.

a) Mussels and Nerves
b) Selective Ionic Filter
c) Electrochemical Changes
d) All of Above

2 _____: Wave Frequency is Below 3.5 Hz in EEG.

a) Alpha (α)
b) Beta (β)
c) Theta (θ)
d) Delta (δ)

3 _____: Electrode Picks Up the Potential Difference from the Live Tissue Surface (Without Damaging Live Tissue).

a) Deep Seated
b) Capacitive Type
c) Surface
d) Needle

4 Electro Dermal Activity Measured by _____ Ways.

a) Silver Silver Electrode
b) BSR
c) BSR and GSR
d) Skin Resistance

5 _____: Instruments Used to Detect Arterial Pulse Pressure Waveforms in the Extremities.

a) Transmission Plethysmograsph
b) Plethysmograsph
c) Reflectance Plethysmograsph
d) Refraction Plethysmograsph

6 _____: mm of Hg is Nominal Pressure Value in Pulmonary System.

a) 5 - 15
b) 6 - 25
c) 30 - 300
d) 60 - 120

7 In Cardio Tachometer, Fast Transition and High Amplitude Components are Attenuated by _____ Block

a) QRS Filter
b) Beat Detector
c) Slew Rate Limiter
d) Heart Rate Detector

8 The Normal pH of the Extracellular Fluid.

a) 6.35 to 7.35
b) 7.00 to 8.00
c) 7.30 to 7.40
d) 7.35 to 7.45

Que 2 **Short Questions (Attempt any SEVEN)** **[14]**

1. Enlist EMG Electrodes.
2. What are the Basic Components of Biomedical Systems?
3. What are Different Blood Pressure Measurement Methods?
4. Define: Systolic and Diastolic Pressures.
5. Explain Briefly Cardiotocograph.
6. Write Briefly on Heart Rate Measuring Techniques.
7. What Do You Mean by Oximitry?
8. Explain Use of Blood Gas Analyzer.
9. Write on Electrical Shock Hazard.

Que 3 **[A]** Write a Detailed Note on Electroencephalograph (EEG). **[06]**

[B] Explain Bioelectric Potential With Necessary Diagram. **[06]**

OR

[B] Discuss ECG Electrodes.

Que 4 **[A]** Give an Account of Bed Side Patient Monitoring System. **[06]**

[B] Write a Note on Rheographic Method Used For (Indirect) Blood Pressure Measurement. **[06]**

OR

[B] Describe Photo Electric Method Used For Pulse Rate Measurement.

Que 5 **[A]** Write on Abdominal Fetal Electrocardiograph. **[06]**

[B] Explain What Arrhythmia is. Write on Arrhythmia Monitoring System. **[06]**

OR

[B] Explain Implantable Telemetry System Used For Blood Pressure and Blood Flow.

Que 6 **[A]** Discuss Blood Gas Analyzer in Detail. **[06]**

[B] Explain Effects of Electrical Currents on Human Body. **[06]**

OR

[B] Explain Blood pO_2 Measurement Technique.

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SEAT No._____ [547]

No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar – 388120

M. Sc. (INSTRUMENTATION & CONTROL)
PS03CINC02: INDUSTRIAL COMMUNICATION TECHNIQUES
Monday, 6 – 11 – 2017, Time: 2:00 pm to 5:00 pm

Total Marks: 70

Note: Figures to the right indicate maximum marks.

Q1. ***Multiple Choice Questions-*** ***[8]***

(1) Most reliable error detection method is [1]
(a) Echoplex (b) Checksum (c) Parity (d) Cyclic Redundancy Check

(2) ..... is used to ensure synchronization of transmitter and receiver clocks. [1]
(a) Scrambler (b) Exact count (c) Flow Integrity (d) Checksum

(3) If the reference bit is '0' and the input data bit is '1' then what data bit is transmitted from DBPSK circuit? [1]
(a) 0 (b) 1 (c) 10 (d) 01

(4) Super Group of FDM hierarchy consists of ..... Channels. [1]
(a) 10 (b) 60 (c) 5 (d) 600

(5) HART delivers information in form of 4-20mA and ..... [1]
(a) ASK (b) PSK (c) FSK (d) QPSK

(6) Which standard is approved by IEEE? [1]
(a) FDDI (b) RS-232 (c) EBCDIC (d) JPEG

(7) Mathematical expression for success rate measured in Slotted Aloha is [1]
(a) $S = Ge^{-G}$ (b) $S = Ge^{-2G}$ (c) $S = Ge^{G}$ (d) all

(8) Duplicate Address test in Token Ring protocol is represented by [1]
a) 000000 (b) 000010 (c) 000100 (d) none

Q2. ***Short answer type questions — attempt any 7*** ***[14]***

(a) A digital signal has a bit rate of 20Kbps. What is the duration of each bit? What is the sampling rate needed for signal with a bandwidth of 10000 Hz in the range of 1000 Hz to 12000 Hz? [2]

(b) List advantages and disadvantages of Digital transmission. [2]

(c) How many time slots are present in European Digital Carrier System and what is its line speed? [2]

(d) For a voice band channel of 4KHz in FDM hierarchy what will be the channel carrier frequency for 9^{th} channel in a group and its output frequency from low pass filter? [2]

(e) What do you understand by Longitudinal currents and Metallic currents? [2]

(f) List different Network topologies with its block diagram. [2]

(g) What do you mean by Circuit switching in Physical layer? [2]

(h) List different types of Field bus. [2]

(i) What is CSMA / CD? [2]

Descriptive questions- ***[48]***

Q3. (a) For a data string of 101101111011, determine the number of Hamming bits required. Place Hamming code into data string at EVEN number position from right (i.e. LSB); determine the status of each Hamming bit. Assume single bit transmission error at bit 13 and prove that Hamming code will detect the error. [6]

(b) Determine the Block Check Sequence for the following data and CRC generating polynomial. [6]

Data, $G(x) = x^7 + x^5 + x^4 + x^2 + x^1 + x^0$ and

CRC, $P(x) = x^5 + x^4 + x^1 + x^0$

Verify it at receiver end for any error.

OR

(c) Explain Relative encoding and Lempel ziv encoding techniques with suitable examples. [6]

Q4. (a) What is Phase Shift Keying? Explain Binary Phase Shift Keying. [6]

(b) Explain with neat diagram Pulse Code Modulation transmission and reception system with its relevant parameters. [6]

OR

(c) Show Super Group bank of FDM hierarchy and explain it with input and output frequency calculations. [6]

Q5. (a) Write a note on RS-232 interface standard. [6]

(b) What do you mean by HART? Explain functions and list advantages of it. [6]

OR

(c) Write the advantage of OSI model and explain the functions of Session layer and Presentation layer. [6]

Q6. (a) Explain Ethernet protocol with its Frame Format. [6]
Consider 802.3 LAN with 500 stations connected to a FIVE 500-meter segments. The data rate is 10Mbps and the slot time is 51.2 μsec. If all stations transmit with equal probability what is the channel utilization using a frame size of 512 bytes?

(b) What is Field bus? List its features, requirements and advantages-disadvantages. [6]

OR

(c) Write a note on IEEE standard 802.5 – Token Ring. [6]

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SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar - 388120

M.Sc. (3rd Sem) Examination - 2017

Instrumentation & Control

PS03CINC03 (Programmable Logic Controllers and DCS)

8th November, 2017 (Wednesday)

2:00 PM - 5:00 PM

Maximum Marks: 70

Que 1 **Each question below gives a multiple choice of answers. Choose the most appropriate one.** [08]

1 _____: Programmable Logic Controller (PLC).

a) Special Purpose Industrial Computer
b) Personal Computer
c) Electromechanical System
d) All of These

2 PLC originally designed to Replace _____.

a) Microcomputer
b) Relay Based Control Systems
c) Industrial Analog Controllers
d) Industrial Digital Controllers

3 _____: Main Element of a PLC Analog Output Module.

a) AC to DC Rectifier
b) DC to AC Rectifier
c) DC to AC Inverter
d) ADC

4 The Memory Organization of PLC can be Divided into _____ Categories.

a) Input and Output Image Files
b) Program and Data Files
c) Timer and Counter Files
d) Control and Integer Files

5 _____: Compare Function Will Give High Output if IN_1 Value is Less Than or Equal to IN_2 Value.

a) Equal To
b) Less Than
c) Less Than or Equal To
d) Greater Than or Equal To

6 Process Signals Collected at the Field Monitoring Station (EFMS) Are Sent Via _____.

a) EOPS
b) EOPC
c) EFCD
d) HF Bus

7 _____: Input Conversion Unit of EFMS.

a) Signal Conditioner
b) Data Transfer
c) Multiplexer
d) Terminal Board

8 The Communication Card of Monitoring Station Control Unit (MCU) Can Communicate With _____.

a) I/O Card
b) HF Bus
c) EMU
d) All of These

Que 2 **Short Questions (Attempt any SEVEN)** [14]

1 Develop Ladder Diagram: When SW1 is Closed, CR1 Goes On, After CR1 Goes On, SW2 Can Turn CR_2 On, When CR2 Goes On, and PL_1 Goes Off.

2 Develop Ladder Diagram For Boolean Equation $P = \overline{(1.4)}.(2+3).(5.6).(7+8+9)$.

3 Explain What Scan Cycle is.

4 Develop Ladder Diagram For Boolean Equation $S = \overline{(A+B+C)}.DE$.

5 Explain PLC Comparison Instruction.

6 Briefly Explain OFF - Delay Timer.

7 Enlist Features of EFMS.

8 Draw Block Diagram of Input Signal Conversion.

9 Enlist Functions of Input Indication.

(P.T.O)

Que 3 [A] Discuss PLC Single Channel AC Input Card. Enlist Advantages of PLC I/O Cards. [06]

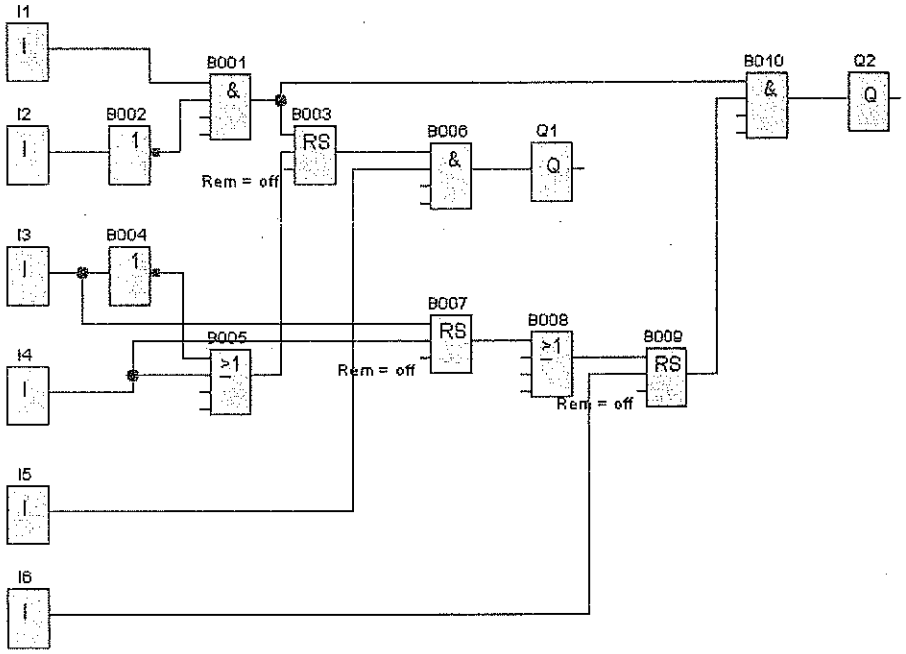
[B] Draw and Explain Internal Architecture of PLC. [06]

OR

[B] Discuss PLC Single Channel DC Output Card. Explain What Latching Relay is.

Que 4 [A] What is ON - Delay Retentive Timer? Draw FBD and Wiring Diagram For Following Problem. [06]
Four Outputs (R, S, T and U). R Starts Immediately as System is ON. S Starts After4 Seconds and T After 5 Seconds of R. U Goes OFF After 2 Seconds of R.

[B] Convert Following FBD Program into Ladder. [06]



OR

[B] Explain PLC UP Counter.
Draw Ladder and Wiring Diagram For Following Problem.
A Machine (M) is to be Turned ON Either When Count A Goes Up to 11 or When Count B Goes Up to 16. One Stop Button is Used to Reset Entire Process.

Que 5 [A] Draw Ladder Diagram For Following Program. [06]
In Batch Process (chemical industry), When Start Pushbutton (PB) is Pressed, if Any Material is Present in the Container, Valve 2 Opens and Container Gets Empty. After 15 Seconds, Valve 1 Opens, 20 Kg Material Enter in Container, and Valve 1 Closes. After 15 Seconds, Heater ON (Heat upto 80°C). When Temperature of Material (Cooling Process) Reaches 40°C, Valve 2 Opens and Tank Gets Empty. Stop PB Stops All Process Immediately. (Start PB: NO; Stop PB: NC; Temperature Sensor: 0 - 500°C & 0 - 25VDC; Weight Sensor: 0 - 50 Kg & 0 - 25 VDC).

[B] Draw Ladder Diagram For Y= $x^2 + 2x + \sin x$. [06]

OR

[B] Draw Ladder Diagram For X = ln $(A^2 + B^2 + C^3)$.

Que 6 [A] Give an Account of EFMS Cabinet Hardware Configuration. [06]

[B] Write a Note on Card Configuration of Monitoring Station Control Unit. [06]

OR

[B] Discuss Annunciator Functions.

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(127) SEAT No._____ No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar 388120
III SEM
M. Sc. (INSTRUMENTATION & CONTROL)
PS03EINC03: SATCOM INSTRUMENTATION
Friday, 10 – 11 – 2017, Time: 2:00 pm to 5: 00 pm

Total Marks: 70

Note: Figures to the right indicate maximum marks.

Q1. ***Multiple Choice Questions-*** ***[8]***

(1) Microwaves are generated by ..... through vibration of electrons. [1]

(a) RC oscillator (b) Magnetron (c) LC oscillator (d) Quartz crystal

(2) .....diversity is generally used in conjunction with space diversity. [1]

(a) Frequency (b) Space (c) Time (d) Polarization

(3) A disturbance in the regular motion of a satelliite is known as. [1]

(a) orbital maneuvers (b) perturbations (c) ground track (d) all

(4) If any planet is farthest from the sun, it is ..... [1]

(a) Apogee (b) Perigee (c) Fourgee (d) Noneji

(5) Beam width and side lobe radiation of both the earth station and satellite antennas are the variables for spatial separation of satellite. [1]

(a) false (b) true (c) both (d) none

(6) Method of measuring physical properties from a far is..... [1]

(a) telephone (b) television (c) telemetry (d) none

(7) Each earth station's transmissions are encoded with a unique binary word called as ..... [1]

(a) chip code (b) data code (c) carrier code (d) bi code

(8) Logical links between stations are pre assigned is ..... [1]

(a) DAMA (b) FAMA (c)SAMA (d) TAMA

Q2. ***Short answer type questions — attempt any 7*** ***[14]***

(a) List advantages and disadvantages of Microwave radio transmission. [2]

(b) What is Noise factor and Noise figure? Write the equations. [2]

(c) Define Bus and Payload in context of satellite. [2]

(d) What is satellite system? Why satellite remains in orbit? [2]

(e) What are the variables on which the spatial separation of satellite depends? [2]

(f) What do you mean by Effective Isotropic Radiated Power? [2]

(g) For a total power (P_t) of 1000W, determine the energy per bit (E_b) for a transmission rate of 50 Mbps. [2]

(h) What are the measurements made by Telemetry system? [2]

(i) Write the equation to count No. of channels in FDMA. [2]

(P.T.O.)

(1)

Descriptive questions- *[48]*

Q3. (a) Describe Frequency diversity in length. [6]

(b) i. Consider a space diversity microwave radio system operating at an RF carrier frequency of 1.8GHz. Each station has 2.4 m diameter parabolic antenna that is fed by 100m of air filled coaxial cable. The terrain is smooth (4), and the area has a humid climate (0.5). The distance between stations is 40km. A reliability objective of 99.99% is desired. Determine the System Gain (G_s). Given that L_b = 4dB, L_f = 10.8dB and $A_t = A_r$ = 31.2dB. [3]

ii. For an equivalent noise bandwidth of 10MHz, determine the Noise Power. If the minimum C / N requirement for a receiver with 10 MHz noise bandwidth is 24dB. Use system gain, G_s calculated in above example. [3]

OR

(c) Explain IF radio repeater block diagram in length. [6]

Q4. (a) Write a note on Geosynchronous Satellites. [6]
Given, A = 42241.0979, mean solar earth days (P) = 0.9972 and 35786 km is height (h) above mean sea level of satellite in geosynchronous orbit around earth. Calculate the orbital velocity and round trip time delay of Geosynchronous satellites.

(b) i. Compare characteristics of LEO and MEO. [3]
ii. Write Kepler's law for planetary motion. [3]

OR

(c) Write a note on satellite Launch considerations. [6]

Q5. (a) Describe Satellite Uplink model and Transponder. [6]

(b) With neat diagram explain Satellite electrical power system. [6]

OR

(c) Draw Command decoder and Data handling unit block diagram and explain its functions. [6]

Q6. (a) Write the features, advantages and disadvantages of FDMA. [6]

(b) Explain CDMA encoder and decoder with neat block diagram. [6]

OR

(c) Show time slot structure and frame format in TDMA and explain each. [6]

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