M. Sc (Instrumentation) Examination, 2019
(1ˢᵗ Year, 1ˢᵗ Semester)
Paper-II (I102)

Subject: Analog, Digital and Power Electronics
Full Marks: 100   Time: 4 Hours

Group-A

Answer any five questions: **5×10=50**

1. Write short notes: (any two) (a) Thyristor, (b) Zener diode as voltage regulator, (c) LED (d) SMPS.   5+5

2. (a) Explain the pinch-off for n-channel FET and draw the output characteristics. (b) Explain the construction and working principle of enhancement type MOSFET.   (3+2)+2+3

3. (a) Derive the expression for closed-loop voltage gain (A_F) Input resistance with feedback (R_{iF}) for an inverting amplifier with feedback. (b) IC 741 is connected as an inverting amplifier with $R_1=1k\Omega$ and $R_F=2.2$ kΩ. Compute the closed loop parameters A_F, R_{iF}.   5+5

4. (a) Why feedback is required for OP-AMP in a linear application? Why negative feed is desirable in amplifier applications? (b) Explain (with circuit diagram) how differentiator circuit works with OP-AMP. (c) Define the common-mode rejection ratio (CMRR)? Explain the significance of a relatively large value of CMRR.   3+4+3

5. (a) What is the slew rate? List causes of the slew rate and explain its significance in applications. (b) Explain the effect of negative feedback on frequency response. (c) Derive the expression of output of an integrator circuit with OP-AMP.   4+2+4

6. (a) If a 741 C is configured as an I-to-V converter, what is the lowest value of current that may be measured? (b) Explain the working principle of Zero crossing detector and Square wave generator.   4+6

7. (a) What is electric filter? Classify them. What do you mean by second order filter? (b) Explain (with circuit diagram) a first order band pass filter with OP AMP and draw the frequency response graph.   4+6

Jadavpur University
M.Sc.(Instrumentation) Examination, 2019
1st year 1st semester
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Use separate answer script for each group

Group- B

Full marks: 50   Time: 2 hours

Section-I

Question No. 1 is compulsory. Answer any two questions from the rest.

1. Answer the following: 1 X 15
   (i)   Draw schematic diagram of a 4 bit word comparator
   (ii)   What is redundant group in Karnaugh map?
   (iii)   What is ASCII code ?
   (iv)   Write De-Morgan's first theorem and draw its logical circuit.
   (v)   What is Schmitt trigger ?
   (vi)   State duality theorem in digital electronics.
   (vii)   What is buffer driver?
   (viii) What are the fundamental products for each of the input words
           $ABC = 001$, $ABC = 011$, $ABC = 110$, $ABC = 111$?
   (ix)   Define Fanout of a TTL device.
   (x)   Draw logic diagram of a edge triggered D flip-flop
   (xi)   Draw schematic diagram of normally on and normally off tri-state switch.
   (xii)   Draw schematic diagram of 8 bit word with odd parity.
   (xiii) Draw logical circuit of a 4 bit summer.
   (xiv)   What is contact bounce?
   (xv)   Schematic diagram of a negative edge triggered J-K flip-flop with clear & preset.

2. What is magnitude comparator? Let two 2 bit numbers are $A = A_1 A_0$ and $B = B_1 B_0$.
   Write expression for $A=B$, $A< B$ & $A>B$.
   Draw logic circuit of that 2 bit magnitude comparator from the above expression.
   Draw schematic diagram of a 2-input NOR GATE TTL circuit.
   Define the following for TTL devices;   (i) Compatibility   (ii) Noise margin
                                   (iii) Worst case output voltages.   1+2+2+2+3

3. (a) Draw the Karnaugh map and write the fundamental products for output of truth table as given
   below. Draw the logic circuit.   3+3

A	B	C	D	Y
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	1	0	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

   (b) Draw schematic diagram of a 4 bit up-dn counter. Explain how it work.   4

4. (a) Draw logic circuit of a mod 12 counter. Explain how it work ?   5

    (b) Explain how a 6 bit ring counter work with necessary schematic diagram?   5

5. Write short notes on the following;
    (i) Successive approximation type 8 bit ADC,
    (ii) Power and propagation delay values of TTL devices.

                                                                                  5X2

Section-II

6. Write short notes on any three of the following: 5X3

    (i) Multivibrator (ii) Regulated power supply
    (iii) Wien Bridge Oscillator   (iv) Semiconductors and their use in electronic devices