BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – M.Tech.(RA)-2024
Course Name – Electronics in Robotic Technology
Course Code - MEC10302A
(Semester I)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) State the sequential logic circuits from of the following. 1.Full adder 2. Full subtractor 3. Half adder 4. J-K flip 5. Counter

a) 1 only
b) 3 and 4
c) 4 and 5
d) 1, 2 and 3

(ii) The output Qn of a J-K flip-flop is 1. It changes to 0 when a clock pulse is applied. The input Jn and Kn are evaluated as

a) 0 and X
b) `1 and X
c) X and 1
d) X and 0

(iii) A BJT with forward current transfer ratio $\alpha = 0.98$, when working in CE mode, calculate current transfer ratio β.

a) 98
b) 0.02
c) 49
d) 0.49

(iv) Show, An operational amplifier possesses

a) Very large input resistance and very large output resistance
b) Very large input resistance and very small output resistance
c) Very small input resistance and very small output resistance
d) Very small input resistance and very large output resistance

(v) An operational amplifier has an open-loop gain of 200,000. Its output exhibits saturation at 10V. Calculate the threshold differential voltage of the amplifier

a) 25μV
b) 50μV
c) 0.5 mV
d) 10V

(vi) Find, if a JFET operates above pinch-off voltage,

a) Drain current remains constant
b) Drain current increases rapidly
c) Drain current decreases gradually
d) Depletion region becomes zero

(vii) A JFET has a value of gmo = 4000 μS. Calculate the value of gm at VGS = – 3V. Given that VGS (off) = – 8V.

a) 2 micro Second
b) 200 micro second
c) 20 micro second
d) 2000 micro second

(viii) Choose the correct Option: If the input is a rectangular pulse, the output of an integrator is

a) Sine wave
b) Square wave
c) Ramp
d) Rectangular wave

(ix) Indicate when, for a JFET, drain current is maximum.

a) when VGS is zero
b) when VGS is negative
c) when VGS is positive
d) when VGS is equal to pinch-off voltage

(x) In D flip-flop, D is indicated as

a) Distant
b) Data
c) Desired
d) Delay

(xi) Write, the transfer of a signal in a transistor is

a) low to high resistance
b) High to low resistance
c) collector to base junction
d) Emitter to base junction

(xii) The cut-in-voltage for gallium arsenide is

a) 1.2 V
b) 0.3 V
c) 0.7 V
d) None of these

(xiii) Choose from the following a part of a BMS that ensures the safety of the battery pack.

a) Charging circuit
b) Monitoring circuit
c) Protection circuit
d) Discharge circuit

(xiv) Select a flyback converter that is commonly used for:

a) Low power applications
b) High power applications
c) Medium power applications
d) Ultra-high power applications

(xv) Choose the 7912 regulator that provides:

a) +12V
b) -12V
c) +5V
d) -5V

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Illustrate the advantages of MOSFET. (3)

3. Write characteristics of an ideal op-amp. (3)

4. In a common base connection, the emitter current is 1mA. If the emitter circuit is open, the collector current is 50 μA. Identify the total collector current. Given that α = 0.92. (3)

5. Explain the charging process in a BMS. (3)

6. Explain 1:2 De-multiplexer through block diagram, truth table, logical expression and circuit diagram. (3)

OR

Explain 2:4 Decoder through block diagram, truth table, logical expression and circuit diagram (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Describe the I-V characteristic of MOSFET. (5)

8. Explain the Summing Amplifier developed by OP-AMP. (5)

9. Given CMRR = 10^5 and differential gain = 10^5, Calculate for the common mode gain of the OPAMP. (5)

10. Explain the construction of transistor with diagram. (5)

11. Explain a flyback converter and its operation. (5)

12. Expain the Construction of 8:1 multiplexer using 4:1 multiplexer and OR gate. (5)

OR

Explain the Construction of 16:1 multiplexer using 4:1 multiplexer only. (5)

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