

Lect 4, 5: BJTs, Electromechanical Components
Practice Problems – Set 1 (April 2, 2023)

MCQs

(1) BJT can be modelled as a dependent source of ‘.....’ Type?

- (a) Voltage controlled voltage source.
- (b) Voltage controlled current source
- (c) Current controlled Voltage source
- (d) Current controlled current source

(d) Collector current is controlled by Base current

(2) In a BJT, which region is heavily doped (concentration of the dopant is high)?

- (a) The collector region
- (b) The base region
- (c) The emitter region
- (d) Both the emitter and base regions

(c) The emitter region is doped with high concentration of the dopants compared to the other two regions

(4) If the power and current gains of a transistor amplifier are 16500 and 100 respectively, then voltage gain is

- (a) 165
- (b) 165×10^4
- (c) 100
- (d) None of the above

(a) As the Power Gain is the product of the voltage gain and the current gain

(5) Freewheeling diode is used

- (a) To prevent over current in the relay coil
- (b) To rectify the input signal
- (c) To have constant impedance during relay operation
- (d) To prevent building of high reverse voltage across coil terminals

(d) Current flows through freewheeling diode when the reverse voltage rises more than the forward conducting voltage (0.7V), preventing to rise further.

(6) The direction of rotation of the DC motor can be reversed by

- (a) Connecting the motor to NO and NC contacts of a relay
- (b) The direction of rotation cannot be reversed for a DC motor
- (c) By connecting a capacitor across it
- (d) By reversing the direction of the current flowing through it

(d) The direction of the current decides direction of the force on windings and the motion. Hence reversing the current direction also reverses the direction of motion

(7) The pulling force of the solenoid can be increased by

- (a) Using a longer spring
- (b) Increasing current through the coil
- (c) Increasing diameter of the coil
- (d) Increasing the length of the shaft

(b) Increasing current through the coil

Numerical Problems

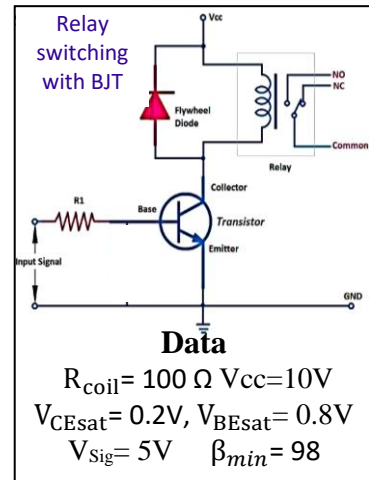
- (1) For the circuit diagram shown in the figure, Calculate
 (a) Collector Current (I_C)
 (b) Base resistance (R_1)

In ON condition, $V_{coil} = 10V - 0.2V = 9.8V$

$$I_C = V_{coil} / R_{coil} = 9.8V / 100\Omega = 98mA$$

$$I_B = I_C / \beta = 1mA$$

$$R_1 = (V_{sig} - V_{BEsat}) / I_B = 4.2k\Omega$$



2. The switching circuit shown below uses a pnp transistor.

Out of the two V_{in} voltages, for which case will the LED will turn ON? Justify your answer.

(i) when $V_{in} = 0V$

(ii) when $V_{in} = V_{cc}$

Given: $V_{cc} = 10V$, $V_{BE} = -0.7V$, $\beta = 50$, $R_B = 20k\Omega$, $R_C = 1k\Omega$, $V_{LED} = 2V$

