53 (EC 301) ELDC

2014

ELECTRON DEVICE AND CIRCUITS

Paper : EC 301

Full Marks : 100

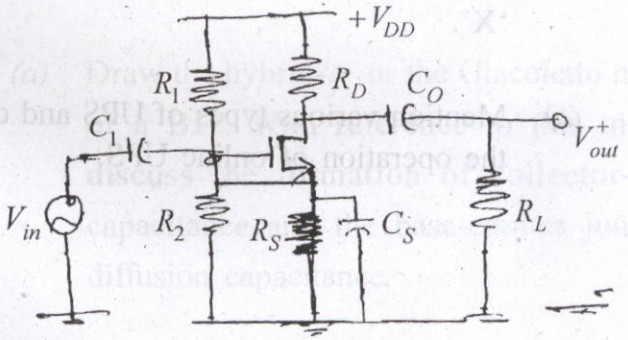
Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

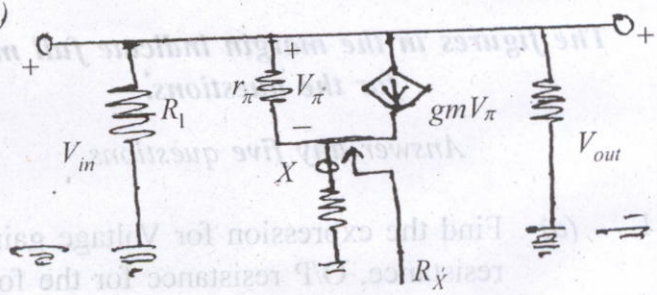
1. *(a)* Find the expression for Voltage gain, Input resistance, O/P resistance for the following Amplifier Circuit 10



(b) Draw the circuit diagram for a basic voltage regulator. Describe the short circuit protection and current limiting techniques in relation to voltage regulator. 10

2. (a) Describe the working principle of a buck-boost voltage regulator with proper circuit diagram. 10

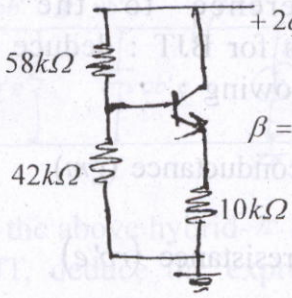
(b)



Find the resistance looking into the node 'X'. 10

3. (a) Mention various types of UPS and describe the operation of online UPS. 10

(b)



Find the *DC* operating point voltage and current levels and Small-signal parameter *gm* & r_{π}. 10

4. *(a)* Classify various types of voltage regulators and explain Buck-converter. 10

(b) Describe the operation of Gilbert Cell multiplier circuit. 10

5. *(a)* Draw the hybrid-π or the Giacoletto model of a BJT. With reference to this model, discuss the formation of collector-base capacitance and the base-emitter junction diffusion capacitance. 10

(b) With reference to the hybrid-π components for BJT : deduce expression for the following : 10

2.

(i) Transconductance (gm)

(ii) Input resistance $(rb'e)$

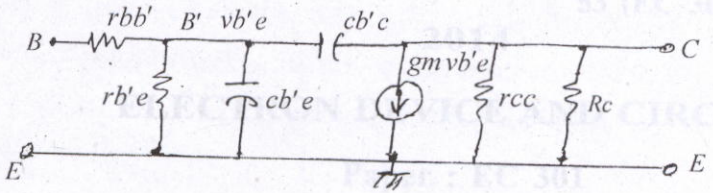
(iii) Base spreading resistance (rbb')

(iv) Feedback resistance $(rb'c)$

6. (a) The following low frequency parameters are known for a given transistor at room temperature and at $I_C = 10mA$ and $V_{CE} = 10V; hie = 500\,\Omega; hoe = 4 \times 10^{-4}\ A/V$ $hfe = 100; hre = 10^{-4}$. At the same operating point, $f_T = 50MHz$ and $cb'c = 3pF$, where the symbols have their usual meaning. Calculate the values of all the hybrid-π parameters. 10

3.

(b) 10



In the above hybrid-π model of a CE-mode BJT, deduce the expression for the short circuit current gain with a resistive load (R_L).

7. *(a)* Show that the bandwidth of a n-stage cascaded identical amplifier is given by $B1n = B_1\sqrt{2^{1/n} - 1}$; where '$B1n$' is the bandwidth of '$n$' stages of the cascaded amplifier and 'B_1' is the bandwidth for the single stage. 10

(b) Write short notes on ***any one*** of the following : 10

(i) Class A power amplifier

(ii) Cross-over distortion and its remedy

(iii) Emitter follower.
