Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4657]-543

S.E. (E & TC/Electronics) (First Semester) EXAMINATION, 2014

ELECTRONICS DEVICES AND CIRCUITS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. No. **1** *or* **2**, Q. No. **3** *or* **4**, Q. No. **5** *or* **6**, Q. No. **7** *or* **8**.

(*ii*) Neat diagrams drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) Draw *h*-parameter models for C_E, C_B and C_C transistor configurations. [6]

(*b*) For the circuit shown in Fig. 1. Silicon transistor with $\beta = 100$ is used. Calculate I_B, I_C and V_{CE}. [6]

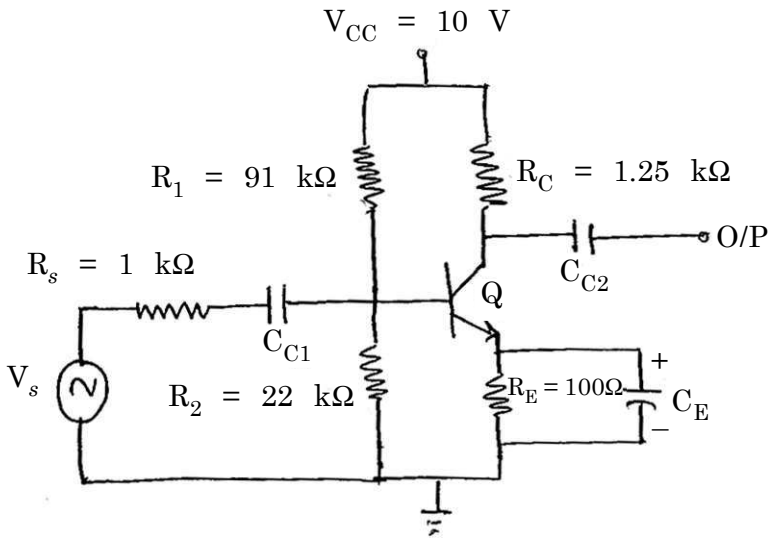

Fig. 1

P.T.O.

Or

2. (*a*) For the circuit shown in Fig. 1, silicon transistor with h_{ie} = 1.1 kΩ, h_{fe} = 50, h_{re} = 2.5 × 10^{-4}, h_{oe} = 25 μA/V is used. Calculate A_i, A_v, R_i, R_i', R_0 and R_0'. [6]

(*b*) Derive the expression for stability factor S for the voltage divider bias circuit. [6]

3. (*a*) Draw and explain Hartley oscillator using BJT. Calculate frequency of oscillation, when C = 0.001 μF, L_1 = L_2 = 100 μH and mutual inductance between L_1 and L_2 is 20 μH. [6]

(*b*) Derive the expression for lower cut-off frequency and higher cut-off frequency in terms of percentage tilt and rise time respectively. [6]

Or

4. (*a*) Determine the input resistance of a series input connection and the output resistance of a shunt output connection for an ideal feedback voltage amplifier in which A_v = 10^5 and A_{vf} = 50. Assume that input and output resistances of the basic amplifier are R_i = 10 kΩ and R_0 = 20 kΩ respectively. [6]

(*b*) Explain the effect of internal capacitances of transistor used in amplifier circuit on bandwidth of amplifier with frequency response curve. Define F_α and F_β separately. [6]

5. (*a*) Draw class B push pull power amplifier and show that maximum efficiency is 78.5%. [6]

(*b*) A transformer coupled class A power amplifier draws a current of 200 mA from a collector supply of 10 V when no signal is applied to it. Determine : [7]

(*i*) Maximum output power

(*ii*) Maximum collector efficiency

(*iii*) Power rating of the transistors.

If the load connected across transformer. Secondary is of 2Ω and transformer turns ratio is 5 : 1.

Or

6. (*a*) Explain with circuit diagram, how even harmonics are eliminated in class B push-pull power amplifier. [6]

(*b*) A sinusoidal signal $V_S = 1.75 \sin (600\ t)$ is fed to a power amplifier. The resulting output current is $I_0 = 15 \sin 600\ t + 1.5 \sin 1200\ t + 1.2 \sin 1800\ t + 0.5 \sin 2400\ t$.

Calculate the percentage increase in the power due to distortion. [7]

7. (*a*) Explain various non-ideal current voltage characteristics of EMOSFET. [6]

(*b*) For the circuit shown in Fig. 2, the MOSFET parameters are V_T = 3V, k = 0.4 mA/V^2. Determine V_{GS}, V_{DS} and I_D and show that MOSFET is biased in the saturation region : [7]

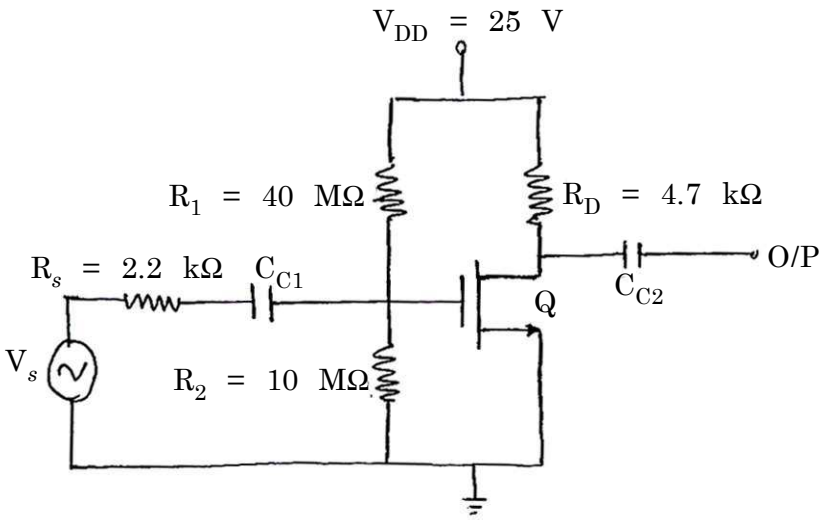

Fig. 2

Or

8. (*a*) For the circuit shown in the Fig. 2, determine g_m, A_v, R_i, R_i', R_0 and R_0'. Given V_T = 3V, k = 0.4 mA/V^2 and r_0 = 40 kΩ. [7]

(*b*) Describe Bi-CMOS technology of MOSFET with circuit diagram. [6]