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SARDAR PATEL UNIVERSITY

Fifth (Vth) Semester (CBCS) B. Sc. Examination (NC)

Saturday,

14th May 2016

Time: 10:30 A.M. To 01:30 P. M.

Subject: PHYSICS [US05CPHY05]

ANALOG DEVICES AND CIRCUITS

Note: All the symbols have their usual meanings.

Total Marks: 70

Q-1

To answer the MCQs choose the correct option.

[10]

- (1) A JFET _____.
(a) is a current control device (b) is a voltage control device
(c) has a low input resistance (d) has a very large voltage gain
- (2) The main advantage of CMOS is the _____.
(a) high power rating (b) low power consumption
(c) switching capability (d) small signal operation
- (3) The voltage that turns on an EMOS device is the _____.
(a) gate source cutoff voltage (b) pinchoff voltage
(c) knee voltage (d) threshold voltage
- (4) At lower cutoff frequency the mid frequency gain of transistor amplifier _____.
(a) becomes doubled (b) increases by $\sqrt{2}$
(c) remains unchanged (d) decreases by factor $\frac{1}{\sqrt{2}}$
- (5) The frequency at which transistor short circuit current gain drops to unity is denoted by _____.
(a) f_{α} (b) f_{β} (c) f_{hfe} (d) f_T
- (6) The maximum achievable efficiency of class A transformer coupled resistive load amplifier is _____.
(a) 72.5% (b) 78.5% (c) 50% (d) 60%
- (7) To operate the transistor power amplifier in class B condition the operating point is set _____.
(a) in the saturation region (b) at the center of the output characteristics
(c) in the cutoff region (d) beyond the cutoff region
- (8) The operational amplifier (opamp) is a high gain _____ coupled amplifier.
(a) inductor (b) transformer (c) capacitor (d) direct
- (9) If non-inverting opamp is used as voltage follower then its voltage gain will be _____.
(a) zero (b) less than 1 (c) greater than 1 (d) 1
- (10) To use the inverting opamp as a logarithmic amplifier feedback resistor is replaced by _____.
(a) diode (b) capacitor (c) short circuit (d) transistor

(1)

(P.T.O)

Q-2

Short answer questions (Attempt Any Ten).

[20]

- (1) Explain briefly about the working of JFET multiplexer.
- (2) What is gate cutoff voltage?
- (3) A JFET has $V_{GS(OFF)} = -6$ V and $I_{DSS} = 4$ mA. What are the gate voltage and drain current at the half cutoff point?
- (4) Calculate transconductance of a transistor. Given $I_c = 2$ mA and temperature $T = 22^\circ$ C.
- (5) Define the term f_T in transistor amplifier. What is the importance of this term?
- (6) Give classification of small signal transistor tuned amplifiers.
- (7) Draw the circuit diagram of transistor phase inverter circuit.
- (8) What is the function of input transformer in push pull amplifier?
- (9) Define conversion efficiency of power amplifier. Give its maximum value for class A and class B power amplifiers.
- (10) Explain the meaning of inverting and non inverting mode of opamp.
- (11) Define (i) CMRR and (ii) slew rate of opamp.
- (12) Define (i) input bias current and (ii) input offset current of opamp.

Q-3

- (a) Give construction of n-channel JFET and explain its drain curves. [06]
- (b) Describe the working of JFET as analog series and shunt switch. [04]

OR

Q-3

- (a) Explain working of Depletion mode MOSFET with suitable diagrams. [06]
- (b) Discuss the application of JFET in Automatic Gain Control (AGC). [04]

Q-4

Obtain h-parameters of a transistor using equivalent circuit. Also With the help of hybrid equivalent circuit of the transistor derive the expression for current gain, [10]

$$A_i = -\frac{h_f}{1 + h_o R_L}$$

OR

Q-4

What is the function of emitter bypass capacitor in a transistor amplifier? Discuss [10] its effect on low frequency gain of a transistor amplifier with necessary derivation.

(2)

- Q-5 (a) What is class A condition of an amplifier? Describe the working of class A push pull amplifier and obtain the expression for its output current. [05]
- (b) Explain the working of complimentary symmetry amplifier with suitable circuit diagram. [05]

OR

- Q-5 (a) Discuss the working of class B push pull amplifier with suitable circuit diagram. Explain cross over distortion present in the output of this amplifier. [05]
- (b) With necessary diagram obtain the maximum achievable efficiency in class B condition of push pull amplifier. [05]
- Q-6 (a) State the characteristics of an ideal opamp. Obtain the expressions for voltage gain in inverting mode of opamp. [06]
- (b) Explain the application of opamp as a differentiator. [04]

OR

- Q-6 (a) Define input and output offset voltages in opamp. Explain the universal balancing technique for balancing offset voltages. [06]
- (b) Explain briefly about the various configurations of differential amplifiers. [04]

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