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SEAT No. \_\_\_\_\_

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# SARDAR PATEL UNIVERSITY

## Vallabh Vidyanagar – 388 120

### B.Sc. (SEMESTER-V) Examination

Thursday, 11<sup>th</sup> April 2019

Time : 10:00 A.M. to 01:00 P.M.

11/04/2019

Subject Code : US05CPHY05 (PHYSICS)  
Subject Title : Analog Devices and Circuits

Total Marks : 70

**Q.1** Write correct answer for each of the following MCQs. (Attempt All) (10)

1. A JFET \_\_\_\_\_  
 (a) is a voltage-controlled device (b) is a current-controlled device  
 (c) has a low input resistance (d) has a very large voltage gain
2. A 2N5459 has  $V_{GS(off)} = -8\text{ V}$  and  $I_{DSS} = 16\text{ mA}$ . What is the drain current at the half-cutoff point?  
 (a) 8 mA (b) 16 mA (c) 4 mA (d) 12 mA
3. The pinchoff voltage has the same magnitude as the \_\_\_\_\_  
 (a) Gate voltage (b) Drain-source voltage  
 (c) Gate-source voltage (d) Gate-source cutoff voltage
4. If temperature changes, hybrid parameters of a transistor \_\_\_\_\_  
 (a) also changes (b) may or may not change  
 (c) do not change (d) none of these
5. The output conductance is measured in \_\_\_\_\_  
 (a) ohm (b) volt (c) ampere (d) mho
6. In a class A amplifier, the output signal is \_\_\_\_\_  
 (a) distorted (b) the same as the input  
 (c) clipped (d) smaller in amplitude than the input
7. The maximum conversion efficiency of a pure class B push-pull amplifier is \_\_\_\_\_.  
 (a) 25% (b) 50% (c) 78.5% (d) 60%
8. In push-pull amplifier the output is free from \_\_\_\_\_  
 (a) odd harmonics (b) even harmonics  
 (c) both odd and even harmonics (d) none of the above
9. An ideal Operational Amplifier has \_\_\_\_\_  
 (a) infinite bandwidth (b) infinite output impedance  
 (c) zero input impedance (d) none of the above
10. The feedback resistor is replaced by \_\_\_\_\_ when OP-AMP is used as an Integrator.  
 (a) diode (b) Transistor (c) short circuit (d) capacitor

**Q.2** Write answers in brief [ANY TEN] (20)

1. Define pinchoff voltage and drain resistance in a JFET.
2. Mention the applications of a JFET.
3. Draw schematic figures of Depletion mode MOSFET and Enhancement mode MOSFET.

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(P.T.O)

4. Define and explain gain bandwidth product.
5. What are the functions of emitter bypass capacitor and coupling capacitor in transistor amplifier?
6. Explain base-spreading resistance giving proper diagram.
7. Explain conversion efficiency of power amplifier and give its value for class A power amplifier.
8. State the drawbacks of transistor phase inverter circuit.
9. Explain cross over distortion in class B push pull amplifier.
10. Explain Operational Amplifier.
11. What are the advantages of active filters over the passive filters?
12. Define CMRR and slew rate.

- Q.3 (a) Discuss in detail drain transconductance and drain curves for a JFET. (6)  
 (b) Discuss the following applications of JFET (4)  
 (1) Analog Multiplexer (2) Chopper

OR

- Q.3 (a) Discuss the analog switching application of JFET. (6)  
 (b) Explain : CMOS (4)
- Q.4 (a) How to obtain hybrid parameters using equivalent circuit ? Discuss in detail. (6)  
 (b) Derive equations for common emitter circuit using h-parameters, (4)  
 current gain  $A_i = \frac{-h_{fe}}{1 + h_{oe} R_L}$  and input resistance  $R_i = h_{ie} + h_{re} A_i R_L$

OR

- Q.4 (a) Discuss in detail the effect of an emitter bypass capacitor on low frequency response of CE amplifier and obtain lower 3-dB frequency  $f_L$ . (6)  
 (b) Explain briefly  $\alpha$  Cutoff frequency and  $\beta$  Cutoff frequency. (4)
- Q.5 (a) Discuss the construction and working of a transformer coupled amplifier with resistive load and obtain its conversion efficiency and maximum power dissipation in the transistor  $P_{D,max}$ . (6)  
 (b) Describe the disadvantages of a single ended transformer-coupled amplifier. (4)

OR

- Q.5 (a) Giving suitable circuit and the diagrams illustrating class B action, discuss working of class B push-pull amplifier. (6)  
 (b) Obtain the optimum conversion efficiency of a class B push pull amplifier. (4)
- Q.6 Explain AC analysis of differential amplifier and obtain, (10)  
 (i) differential mode gain (ii) common mode gain (iii) common mode rejection ratio.

OR

- Q.6 Discuss the ideal OP-AMP in detail and describe the applications of OP-AMP, (10)  
 (i) Summing amplifier (inverting mode) (ii) OP-AMP as an Integrator.

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