GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-III EXAMINATION – WINTER 2015

Subject Code:131101 Date:23/12/2015 **Subject Name: Basic Electronics Time: 2:30pm to 5:00pm Total Marks: 70 Instructions:** 1. Attempt all questions. 2. Make suitable assumptions wherever necessary. 3. Figures to the right indicate full marks. Q.1 (a) In the circuit shown in Fig.1, [IDSS] = 4mA, $V_p = 4V$. Find the quiescent values 07 of 1D, VGs and VDs of the FET. Establish from first principles, the continuity equation, valid for transport of 07 (b) carriers in a semi-conductor Q.2 Why filters are used along with rectifiers in the construction of a power supply? 07 (a) List the filter types used in power supplies. Explain their effect on rectifier output waveforms. The h-parameters of the transistor in the amplifier circuit shown in fig-2 are: 07 (b) hie=2.2 Kilo ohms, he=52, he= 25 micro mhos and he is negligible. The output load resistor dissipates a signal power of 9 mW. Determine the power gain of the amplifier using its equivalent circuit. The reactance's of the capacitors may be neglected OR (b) Explain with the help of circuit diagram the working of of Tunnel Diode in 07 detail. A sample of pure silicon has electrical resistivity of 3000Ω m. The free carrier 07 Q.3 (a) density in it is 1.1×10^6 /m₃. If the electron mobility is three times that of hole mobility, find electron mobility and hole mobility. The electronic charge is equal to 1.6×10^{19} coulomb. (b) Describe how conductivity and carrier mobility of a sample of semiconductor 07 can be determined by subjecting it to Hall-effect. OR Q.3 (a) A triangular wave shown in fig(3a) is applied to the circuit in fig(3b). Explain 07 the working of the circuit. Sketch the output waveform. Distinguish between avalanche and zener breakdown in p-n junction diode. 07 (b) Q.4 In a circuit shown in figure 4, calculate and sketch the waveforms of current i 07 (a) over one period of input voltage. Assume the diodes to be ideal. Define 'diffusion capacitance' of a pn junction diode. Obtain an expression for 07 (b) the same. Why is the diffusion capacitance negligible for a reverse biased diode? OR Q.4 (a) Draw a small signal h-parameter equivalent circuit for the CE amplifier shown 07 in fig 5 07 Draw a neat sketch to illustrate the structure of a N-channel E-MOSFET. (b) Explain its operation.

- (a) What are the important characteristics of a cascade amplifier? Write the circuit Q.5 of cascade amplifier and determine an expression for its voltage gain in terms of its circuit parameters.
 - (b) A half-wave rectifier has a load resistance of 3.5 K Ω . If the diode and secondary of the transformer have a total resistance of $800 \text{K}\Omega$ and the ac input voltage has 240 V (peak value), determine: (i) peak, rms and average values of current through load
 - (ii) DC power output
 - (iii) AC power input
 - (iv) rectification efficiency

OR

- (a) Derive mathematical expressions to illustrate the effects of negative feedback Q.5 07 (i) to improve gain stabilization (ii) to reduce distortion (iii) to modify input and output impedances.
 - 07 (b) Explain the classification of power amplifiers according to operational modes.

















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