DECEMBER 2020: END SEMESTER ASSESSMENT (ESA), B.TECH
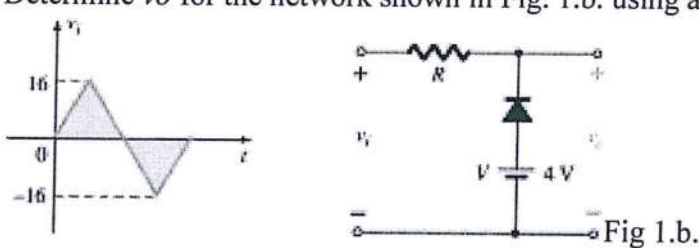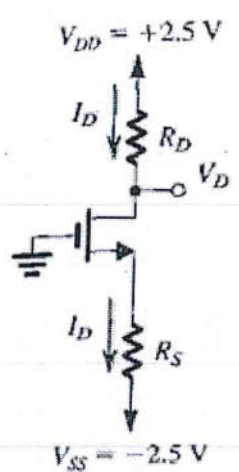### Analog Circuit Design

Time: 3 Hrs	Answer All Questions	Max Marks: 100

1	a)	Define the diffusion and transition capacitance of a PN junction diode. With relevant diagram explain the reverse recovery time (t_{rr}) in a diode.	7
	b)	Determine *vo* for the network shown in Fig. 1.b. using a silicon diode with $V_T = 0.7$ V. Fig 1.b.	6
	c)	(i) Find the magnitude gain corresponding to a decibel gain of 100. (ii) The input power to a device is 10,000 W at a voltage of 1000 V. The output power is 500 W, while the output impedance is 20 Ω. Find the power gain and the voltage gain in decibels.	7

2	a)	With neat circuit diagram explain the Common gate MOSFET amplifier and its small signal equivalent model.	7
	b)	With the help of neat diagram, explain the construction and operation of a depletion type MOSFET. Also sketch the characteristics.	6
	c)	Design the circuit of Fig. 2.c. to establish a drain current of 1 mA and a drain voltage of 0 V. The MOSFET has $V_T = 1$ V, $\mu_n C_{ox} = 60$ µA / V^2, L = 3 µm, and W = 100 µm. Fig.2.c.	7

3	a)	With a neat circuit diagram explain the frequency response of Common emitter amplifier.	7
	b)	For a class B amplifier operation, show that the maximum conversion efficiency obtainable is 78.5%.	6
	c)	For a class B amplifier providing a 20V peak signal to a 16 Ω load (speaker) and a power supply of V_{CC} = 30 V, determine the input power, output power, and circuit efficiency.	7
4	a)	With a neat block diagram derive an expression for the input and output impedances of the voltage series feedback.	7
	b)	Determine the voltage gain, input, and output impedance with feedback for voltage series feedback having A=100, Ri = 10 KΩ, Ro = 20 KΩ for feedback of (a) - 0.1 and (b) - 0.5.	6
	c)	Explain the Nyquist criteria to determine the stability of an amplifier. Define Gain margin and Phase margin.	7
5	a)	Derive an expression for the output of Inverting integrator and inverting differentiator circuits.	7
	b)	With the help of neat circuit diagram briefly explain the operation of an instrumentation amplifier.	6
	c)	Explain the operation of Monostable multivibrator using 555 timer.	7