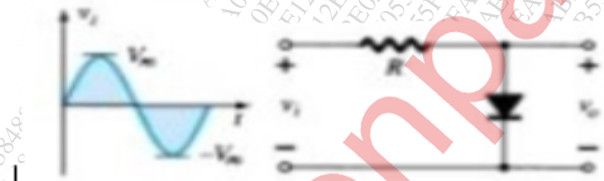


University of Mumbai
Examinations Summer 2022

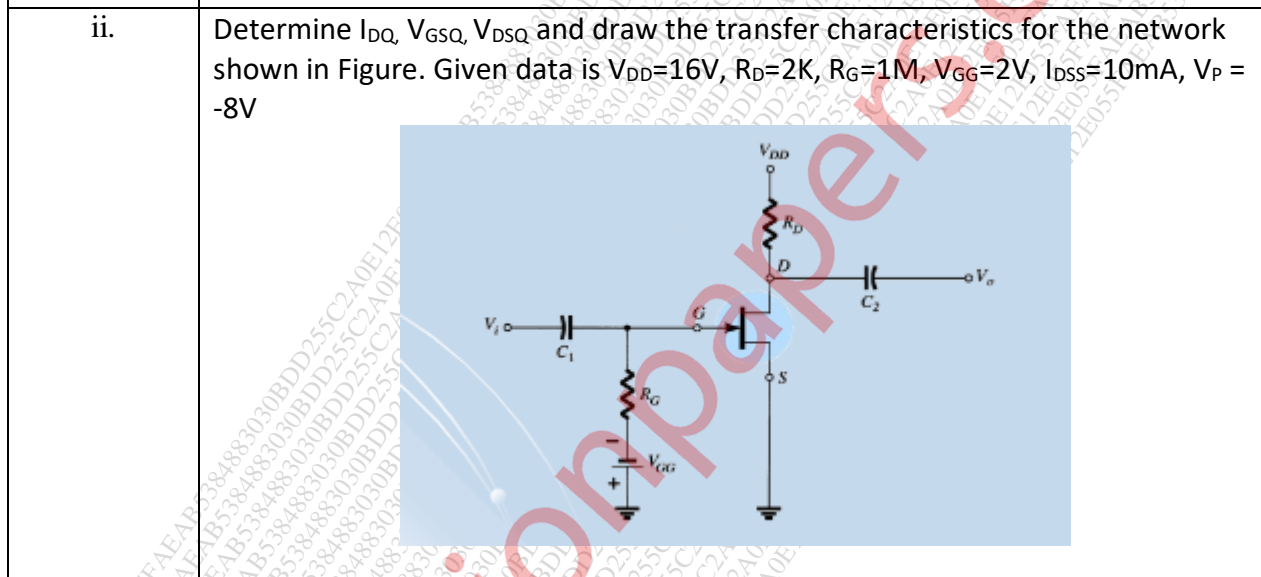
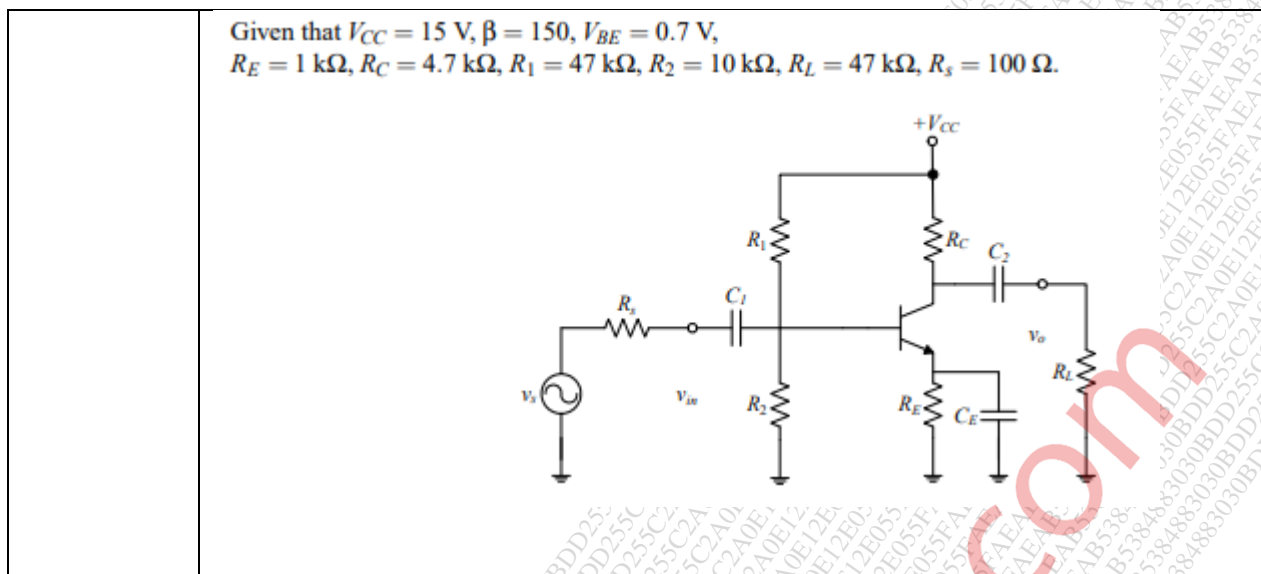
Time: 2hour 30 minutes

Max. Marks: 80

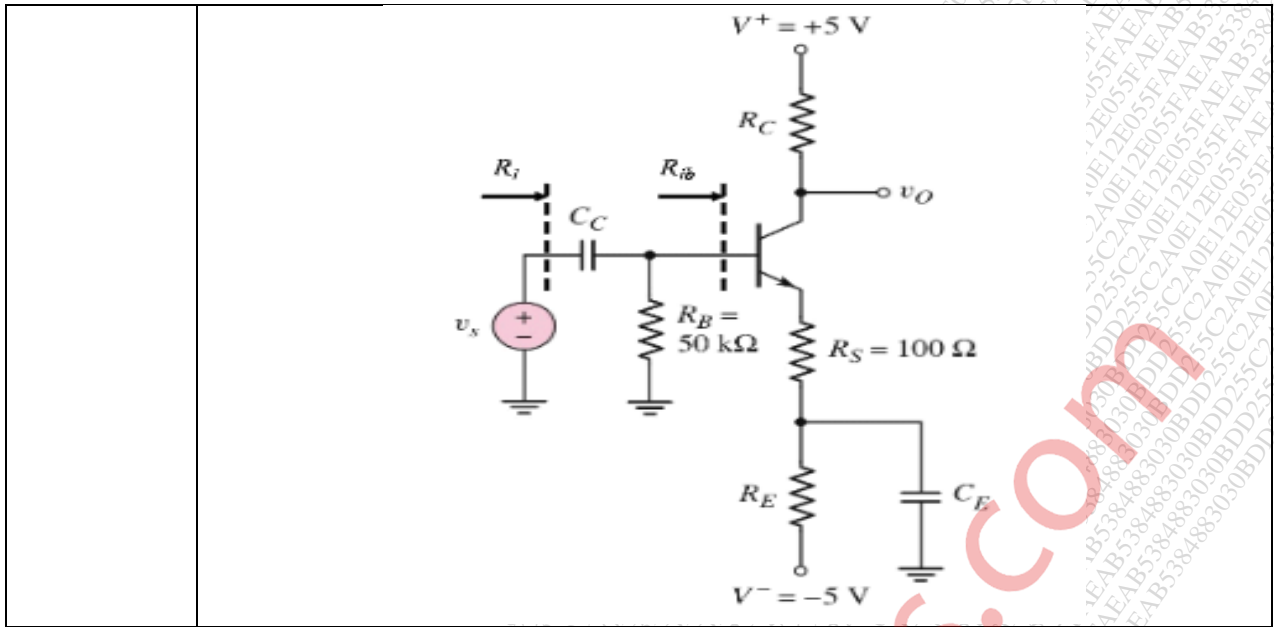
Q1. (20 Marks)	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Name the current produced due to motion of charge carriers from a region of higher concentration to a region of lower concentration?
Option A:	drift current
Option B:	diffusion current
Option C:	electron current
Option D:	hole current
2.	Why is the silicon mostly chosen when compared to germanium?
Option A:	low power consumption
Option B:	high efficiency
Option C:	greater working temperature
Option D:	large I_{CBO}
3.	Assume the diode is ideal. What will be the peak value of the output waveform for the given circuit. 
Option A:	V_m
Option B:	$-V_m$
Option C:	$+(V_m - V_d)$
Option D:	$-(V_m - V_d)$
4.	For following which two transistors Shockley's equation is applied to relate the input and output quantities?
Option A:	BJT and FET
Option B:	BJT and JFET
Option C:	BJT and depletion-type MOSFETs
Option D:	JFETS and depletion-type MOSFETs
5.	Calculate the base resistance R_B for the fixed bias common emitter BJT for dc voltage $V_{CC} = 20V$ and base current $I_B = 25\mu A$. Assume $V_{BE} = 0.7V$
Option A:	$50 K\Omega$
Option B:	$700K\Omega$
Option C:	500Ω
Option D:	$772K\Omega$
6.	For the common-base characteristics the maximum power curve is defined by the following equation
Option A:	$P_{Cmax} = V_{CB}I_C$

Option B:	$P_{C_{max}} = V_{CB}/I_C$
Option C:	$P_{C_{max}} = V_{CB} + I_C$
Option D:	$P_{C_{max}} = V_{CB} - I_C$
7.	What will be the current flowing through the gate terminal of an FET?
Option A:	I_{DSS}
Option B:	$I_{DSS}/2$
Option C:	$I_{DSS}/4$
Option D:	zero
8.	If a MOSFET is to be used as an amplifier then it must work in _____
Option A:	Cut-off region
Option B:	Triode region
Option C:	Saturation region
Option D:	Both cut-off and triode region can be used
9.	If $I_{DSS} = 10\text{mA}$, $V_P = -8\text{V}$, calculate I_{DQ} when $V_{GS} = -2\text{V}$ for n channel fixed bias JFET
Option A:	10mA
Option B:	1.6mA
Option C:	5.625 mA
Option D:	40mA
10.	There is no direct electrical connection between the -----terminal and the channel of a MOSFET
Option A:	Drain
Option B:	Gate
Option C:	Collector
Option D:	Emitter

Q2 (20 Marks)	
A	Solve any Two (5 marks each)
i.	Explain Construction, Operation and Characteristics of Schottky diode.
ii.	Write the diode equation and discuss the effect of temperature on diode current.
iii.	Find I_{BQ} , I_{CQ} and V_{CEQ} for the given bias circuit. Given $\beta = 100$
B	Solve any One 10 marks each
i.	Determine Z_i , Z_o , A_v , A_i and calculate the same for the circuit given below.



Q3 (20 Marks)	
A	Solve any Two 5 marks each
i.	Only draw the energy band diagrams of the diode in equilibrium condition, forward bias and reverse bias.
ii.	Explain Construction, Operation and Characteristics of E-MOSFET.
iii.	Explain the construction, working and characteristics of Photodiode.
B	Solve any One 10 marks each
i.	Design a single stage CE Amplifier to give a voltage gain $A_v \geq 125$ with stability factor $S \leq 10$ and output voltage of, $V_o \text{ rms} = 3\text{V}$. Assume $V_{cc} = 18\text{V}$ and $V_{BE} = 0.7\text{V}$. Use npn transistor with specifications: $h_{fe}(\text{min}) = 145$, $h_{fe}(\text{typ}) = 180$, $h_{ie} = 4.5\text{k}\Omega$, and frequency $f_L \leq 50\text{ Hz}$.
ii.	For the circuit shown in figure, the transistor parameters are $\beta = 100$ and $V_A = \infty$. Determine R_c , R_E , r_{π} , r_o and g_m such that $I_{CQ} = 0.25\text{ mA}$ and $V_{CEQ} = 3\text{V}$.



Q4 (20 Marks)	
A	Solve any Two 5 marks each
i.	Draw Half wave rectifier circuit and explain working with waveforms.
ii.	Write short note on Zener as Voltage Regulator.
iii.	Draw and Explain biasing methods for D-MOSFET.
B	Solve any One 10 marks each
i.	Explain Full Wave Bridge rectifier with a neat, labeled circuit diagram & input-Output Waveforms. Also determine the expressions for the following <ul style="list-style-type: none"> a. I_{DC}, I_{rms}, V_{DC}, b. Output Power (P_{DC}) c. Input Power (P_{AC}) d. Rectifier Efficiency e. Ripple Factor f. Peak Inverse Voltage (PIV) g. Transformer Utilization Factor (TUF) h. % Voltage Regulation
ii.	Determine Zi, Zo and voltage gain for the given circuit., if $V_{GSQ}=0.35\text{ V}$ & $I_{DQ}=7.6\text{ mA}$.

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