[3 Hours] **[Total Marks :-80]**

N.B: (1) Question No.1 is compulsory.
(2) Solves any three out of remaining question.
(3) Assume suitable data if necessary.

1. Any four

a Draw characteristics of PN junction in thermal equilibrium and explain. **5**

b. Explain the operation of MOSFET as amplifier. **5**

c. Explain construction, working principle and characteristics of Photodiode. **5**

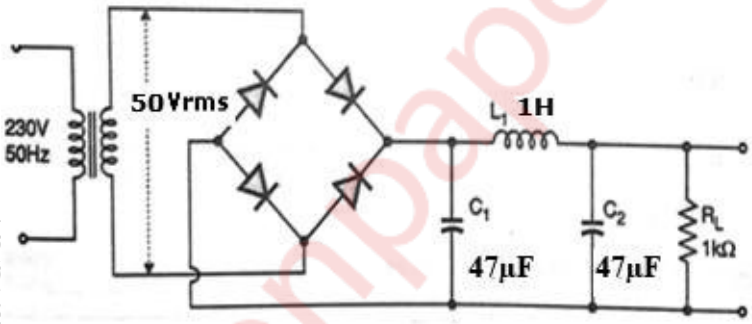
d. Compare HWR, FWR and Bridge rectifier. **5**

e. Compare Zener and avalanche breakdown **5**

2.

a. Draw and explain positive and negative clamper circuit. **10.**

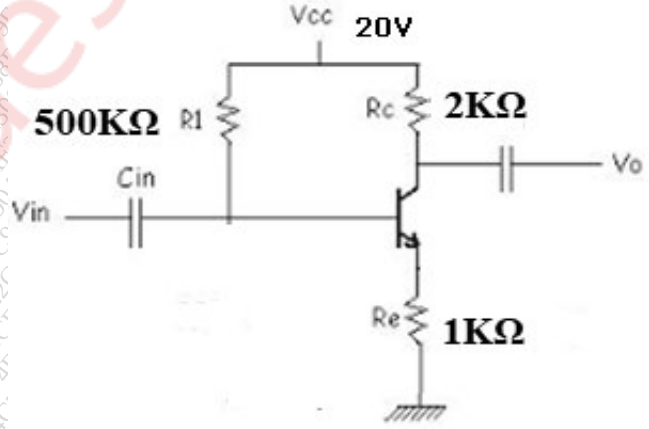
b. Calculate dc load voltage, an ac ripple in output and ripple factor **10**



3.

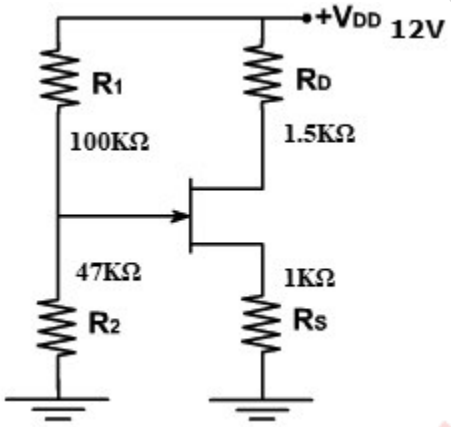
a. Draw and explain VI and CV characteristics of p-channel Enhancement type MOSFET. **10**

b. Find I_B, I_C, V_C, V_E, and V_{CE} for following circuit (β=100). **10**



4

a. Find V_{GSQ}, I_{DQ}, and V_{DSQ} for following circuit. (VP= -4V, IDSS= 6mA) **10**



b. Compare CE,CB and CC amplifiers **10**

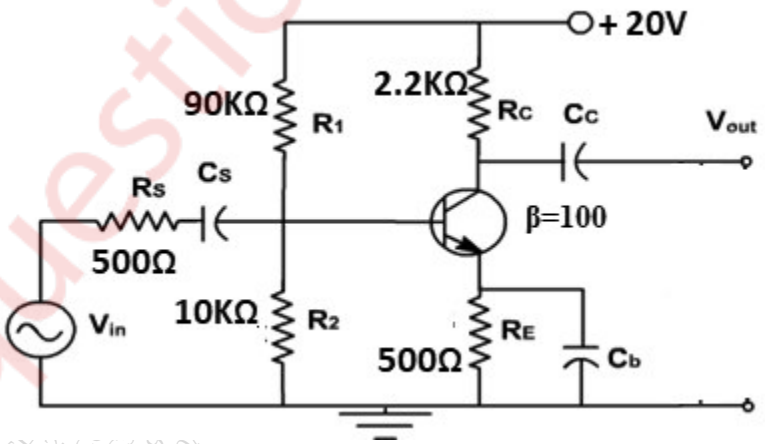
5.

a. Design single stage CE amplifier for $A_V \geq 110$, $V_O$rms= 3 V, h_{FE} =180,h_{fe}=220
h_{ie} = 2.7 KΩ, S≤10, $f_L \leq$ 15Hz $V_{CE\ sat}$ = 0.25V, V_{BE}= 0.7 V. **15**

b) Compare D-MOSFET and E-MOSFET. **05**

6

a. Find Zi, Zo, Av and Avs for following circuit. **10**



b) Compare capacitor, inductor, LC and π filter. **10**

DBEC DATA SHEET

Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 25°C Amps	$V_{CE}^{(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{BEO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal h_{fe} min.	typ.	max.	V_{BE} max.	θ_{j_a} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN 055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN 149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

Transistor type	h_{ie}	h_{oe}	h_{re}	θ_{j_a}
BC 147A	2·7 K Ω	18μ ℧	1·5 × 10^{-4}	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	3·2 × 10^{-4}	—
BC 147B	4·5 K Ω	30μ ℧	2 × 10^{-4}	0·4°C/mw
ECN 100	50 Ω	—	—	—
ECN 149	15 Ω	—	—	—
ECN 055	12 Ω	—	—	—
2N 3055	6 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

–V_{GS} volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
I_{DS} max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
I_{DS} typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	1·7	0·8	0·2	0·0	0·0	0·0	0·0
I_{DS} min. mA	4·0	3·0	2·2	1·6	1·0	0·5	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0

N-Channel JFET

Type	V_{DS} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{os} (typical)	–V_p Volts	r_d	Derate above 25°C	θ_{j_a}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW