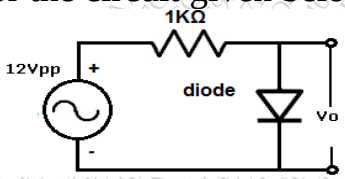
(3 hrs.) Maximum Marks = 80

Q1. is compulsory.
Attempt any **three** question from **Q.2 to Q.6.**
Assume suitable data if necessary.

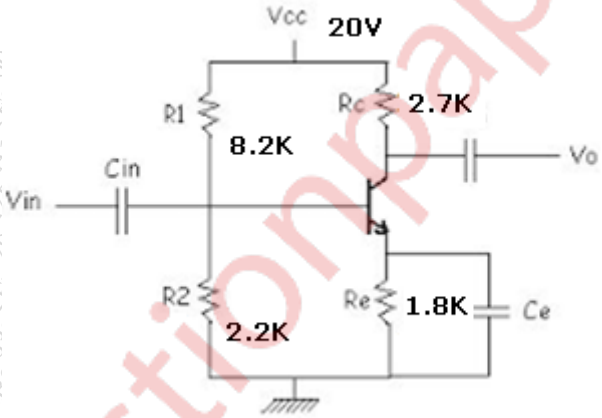
Q.1 Write any **four**. **20**

a) Explain working of pn junction diode and its V-I characteristics.
b) What is early effect in BJT?
c) Explain Zener diode as a voltage regulator.
d) Write short note on Tunnel diode.
e) Draw output waveform for the circuit given below



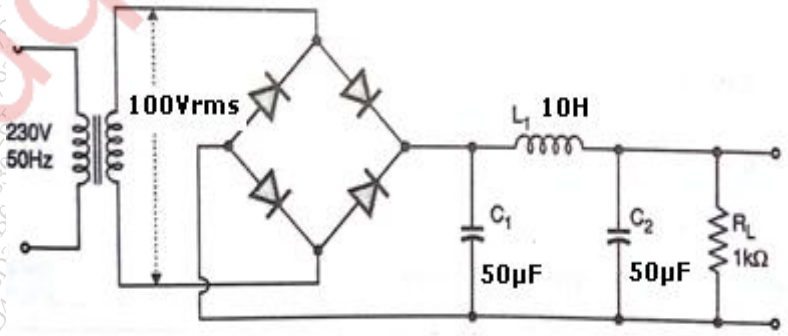
Q.2

a) Explain construction and working of solar cell and LED. **10**
b) Find Q point if β=120. Also draw dc load line. **10**



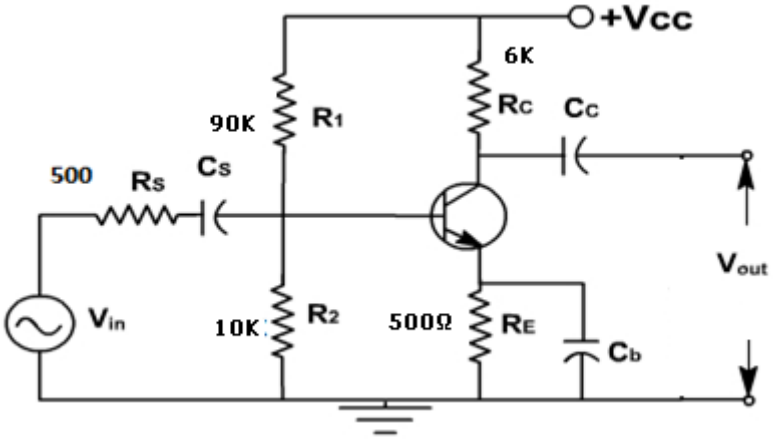
Q.3

a) Explain with construction working and characteristic operation of n-channel D-MOSFET. Also compare it with E-MOSFET. **10**
b) Calculate dc load voltage, an ac ripple in output and ripple factor. **10**



Q.4

a) Find Zi, Zo, A_V and A_{vs} using Hybrid-∏ model (V_{BE}=0.7V, β=100) **10**



b) Explain working of Full wave rectifier with LC filter. Also draw output waveforms and derive expression for ripple factor. **10**

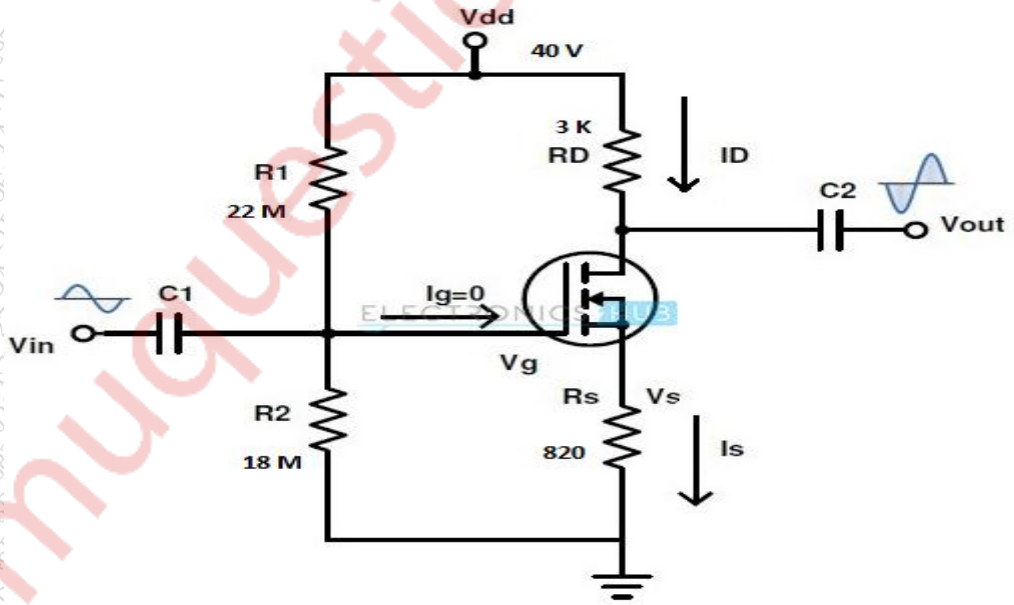
Q.5

a) Design single stage CE amplifier for $A_V \geq 180$, h_{fe} =220, V_{CC} = 18 V, h_{ie} = 2.7 K, $S_{ICO} \leq 10$, $f_L \leq$ 20Hz $V_{CE\ sat}$ = 1V , V_{BE}= 0.7 V. h_{re} =h_{oe} = 0 **15**

b) Explain positive and negative clampers. **05**

Q.6

a) Find I_{DQ}, V_{DSQ} and V_{GSQ} if $V_{GS\ TH}$ =5 V, $I_{D\ ON}$ =3mA and $V_{GS\ ON}$ = 10 V **10**



b) Compare CE, CB and CC configuration of BJT amplifier. **10**

DBEC DATA SHEET

Transistor type	Pdmax @ 25°C Watts	Icmax @ 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_{EBO} volts d.c.	T_j max °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal h_{fe} min.	Small Signal h_{fe} typ.	Small Signal h_{fe} max.	V_{BE} max.	θ_{jc} °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	hie	hoe	hre	θja
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

-Vgs 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
Ids 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
Ids 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
Ids 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_{mo} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
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