Con. 7940-13. **LJ-10537**

(3 Hours) **[Total Marks : 100**

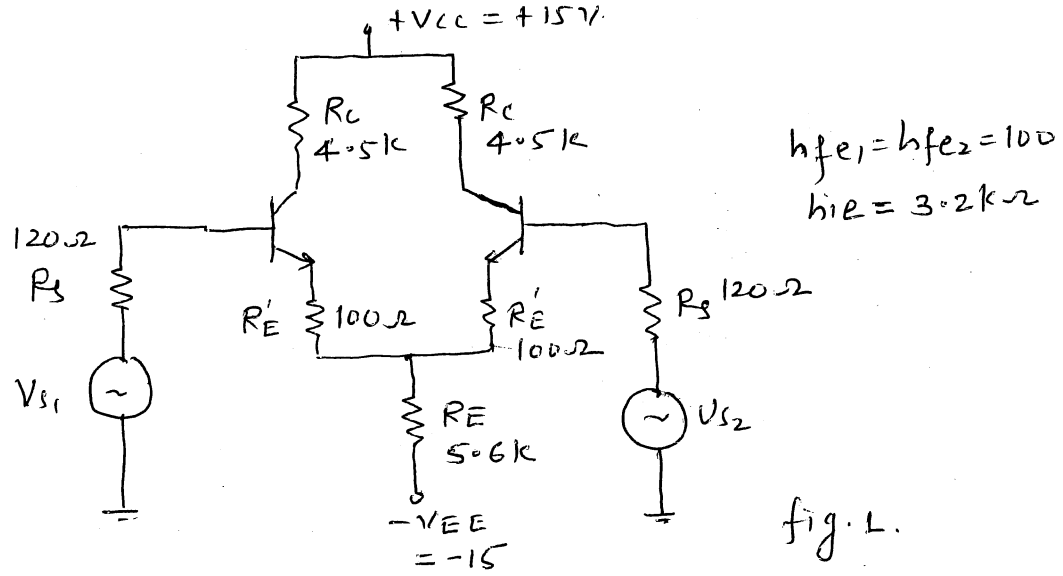
N.B. : (1) Question No. **1** and **2** is **compulsory**.
(2) Answer any **three** from **remaining** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable **data** if **required**.

Q1. a Design two stage R-C coupled amplifier using BC-547B transistor for the following parameters: Av ≥ 600, V_{CC}=12V,S_{ICO}≤10,llower cutoff frequency F_l=10Hz. 15

b For the above designed amplifier determine; Av,V_{Omax}, Rin, and Ro . 05

Q2. a Design large signal transformer coupled class A power amplifier to provide 6w output power to the 4 ohms load. 10

b For the differential amplifier shown in fig.1 determine: 10
i) D C bias conditions,
ii) Differential mode gain Ad ,
iii) Common mode gain AC, and
iv) Differential mode input impedance and output impedance.



Q3. a A three stage RC coupled amplifier uses FET with the following parameters: g_m=2.5 mA/V,r_d=7.5kΩ,R_D=10kΩ,R_G=1.2MΩ,coupling capacitor Cc=0.005μf and Cs=∞.Evaluate 08
i) The overall mid-band voltage gain in dB
ii) Lower 3-dB frequency of individual stages and
iii) Overall lower 3-db frequency.

b Draw two stage CE amplifier and derive the expressions for i) Small signal mid-band voltage gain, ii) Input impedance, and iii) Output impedance. 12

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Q4. a For the feedback amplifier shown in fig. 2, (i) Identify the type of feedback and (ii) Derive the expression **for** A_{VF}, R_{IF}, **and** R_{OF} using negative feedback approach. 12

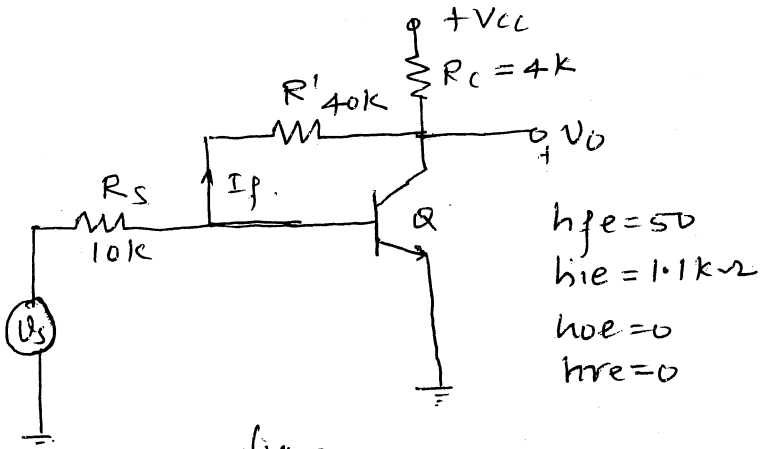

fig.2

b Explain the working principle of a Wein bridge oscillator. Derive the expression for the frequency of oscillation and the value of gain required for sustained oscillation. 08

Q5 a Enumerates the effects of negative feedback on i) gain, ii) frequency response,iii) Distortion,iv) Noise and v) Input and output impedance. 08

Q5 b For the amplifier shown in fig.3 determine V_{B1} ,V_{B2}, I_{CQ} ,Av, Ri and Ro. 12

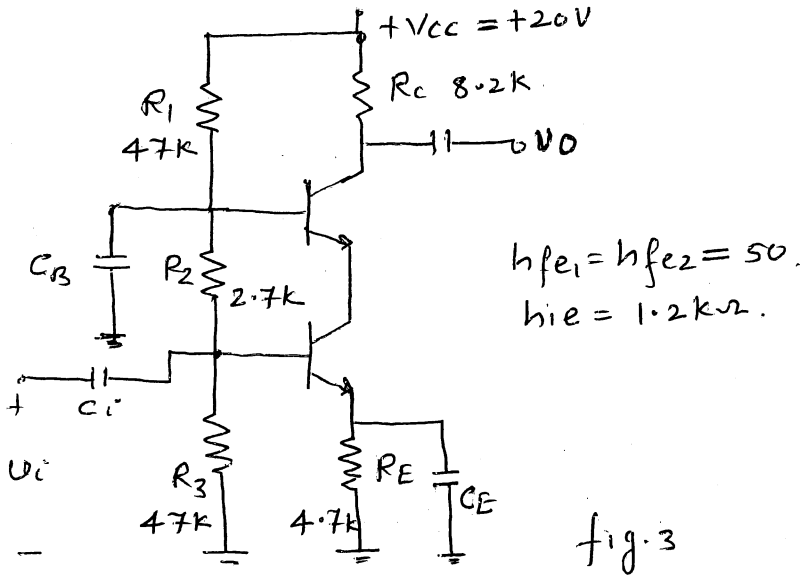

fig.3

Q6 a Draw the circuit diagram for class B push-pull power amplifier and derive the expression for conversion efficiency. 10

b With neat sketch, explain the working of an emitter coupled astable multivibrator. State the advantages of emitter coupled astable multivibrator. 10

Q7 Write a short note on following. 20

a Colpitt's oscilator.

b Frequency response of R-C, Direct coupled and transformer coupled amplifier

c Crossover Distortion in power amplifier.

d Class C power amplifier.

Transistor type	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	$V_{CE}^{(sat)}$ volts d.c.	V_{CEO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CEX} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{EBO} volts d.c.	T_j max °C	D.C. current gain min.	typ.	max.	Small - Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °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	500 Ω	—	—	—
ECN 149	250 Ω	—	—	—
ECN 055	100 Ω	—	—	—
2N 3055	25 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

−Vos 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
Ios 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
Ios 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
Ios 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_{os} max. Volts	V_{oo} max. Volts	V_{oi} 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_{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