SE(III) Choice Based (CBSGS) (2019) 01/06/18

Sub:- Electronic Instruments and Measurements

Q. P. Code : 34585

[Time: Three Hours] [Marks:80]

Please check whether you have got the right question paper.

N.B: (i) Question No. 1 is compulsory & attempt any three out of the remaining five questions.

(ii) Assume suitable data if required but justify it logically wherever applicable. Figures to the right indicate full marks & every sub-question from Q.2 to Q.6 have equal weightage And have 10 marks each.

Q.1 Attempt any four **20**

(a) Define the following static characteristics of instruments.
(i) Sensitivity
(ii) Precision
(iii)Dead zone
(iv)Drift.
(v) Accuracy

(b) Draw a neat circuit diagram of LCR - Q meter & explain its operating principle.

(c) Compare dual slope and dual beam CRO.

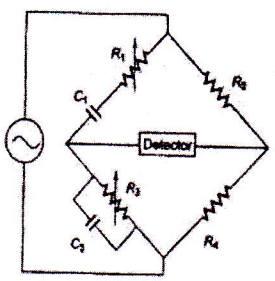
(d) Describe operating principle of harmonic distortion analyzer with a neat block diagram.

(e) With a neat diagram, explain the principle of digital time measurement.

(f) Compare sensor and transducer.

Q.2 (a) Voltmeter having a sensitivity of 1000 ohm/volts read 100V on its 150 V scale when connected across an unknown resistor in series with a millimeter, when millimeter reads 5m A **20**
(i) Calculate apparent resistance of unknown resistor.
(ii) Calculate actual resistance of unknown resistor.
(iii)Calculate error due to loading effect of voltmeter.

(b) Wien Bridge is one of the AC bridges as shown in the Fig. 1 below. Derive conditions under which the bridge becomes balanced. Which quantity / parameter is it used to measure?



Q.3 (a) Draw the block diagram of dual trace CRO and explain its operation. **20**
(b) Explain how Lissajous patterns / figures are used for measurement of an unknown frequency & phase shift using a cathode ray oscilloscope (CRO).

Q.4 (a) Draw the circuit diagram and explain the operation of bridge used to measure capacitance. **20**
(b) Explain various features of digital storage oscilloscope.

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Q.5 (a) Draw the neat diagram and explain the operation of successive approximation type DVM. **20**

(b) In a food processing unit, a highly acidic solution is stored in a storage tank where its level has to be continuously monitored round the clock. Your supervisor suggests that due to highly acidic nature of the solution, a non-contact transducer should be used for the level measurement? Which transducer will you use for above application? Describe its operation with a neat diagram.

Q.6 (a) Draw the diagram and explain the operation of Rotameter. **20**

(b) Explain the operation of Pirani gauge for pressure measurement?

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SE | III | Choice Based | GTRX | ENAS | 02/06/18

Sub:- Electrical Network Analysis And Synthesis

Q.P.Code: 38717

(3 Hours) [Total Marks: 80]

N.B: (1) Question No.1 is **compulsory.**

(2)Attempt any **three** questions from **remaining** questions.

(3)Assume suitable **data if required.**

(4)**Attempt every question in a group and not randomly.**

1. (a) Check for Hurwitz polynomial (20)

$Q(S) = S^5 + S^3 + S^1$

$Q(S) = S^4 + 6S^3 + 8S^2 + 10$

(b) Obtain s-domain (Laplace Transform) equivalent circuit diagram of an inductor and capacitor with initial conditions.

(c) What are conditions for rational function F(S) with real coefficient to be p.r.f?

(d) Explain Y-parameter in terms of Z-parameter.

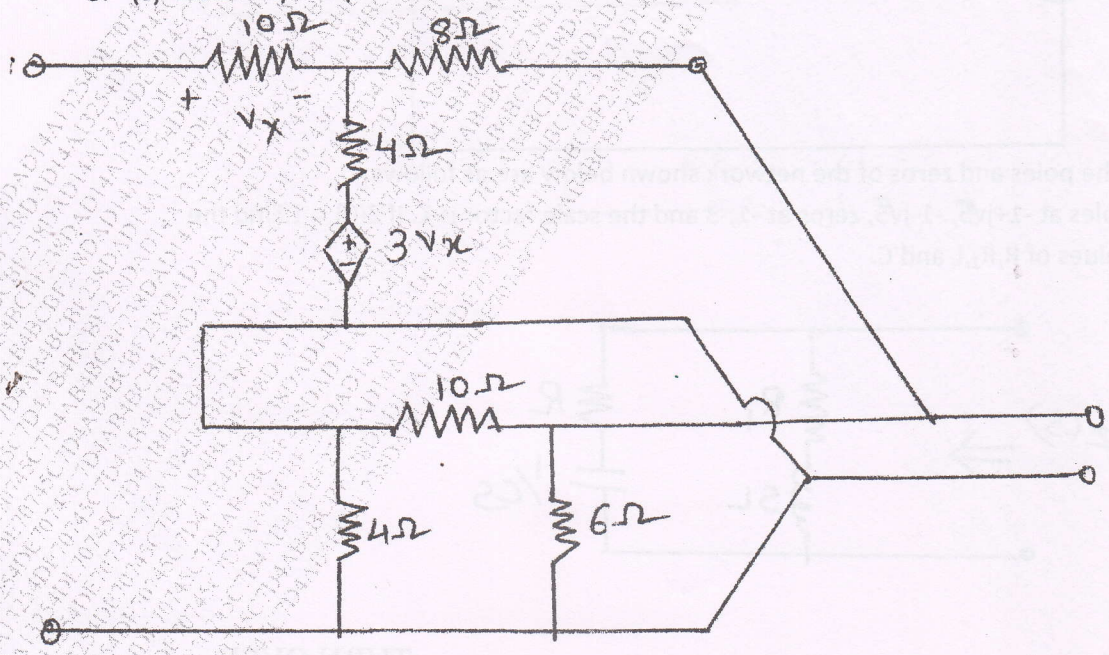
2. (a) Realise the following function in Foster-I and Foster-II forms. (20)

$$Z(S) = \frac{3(S+2)(S+4)}{S(S+3)}$$

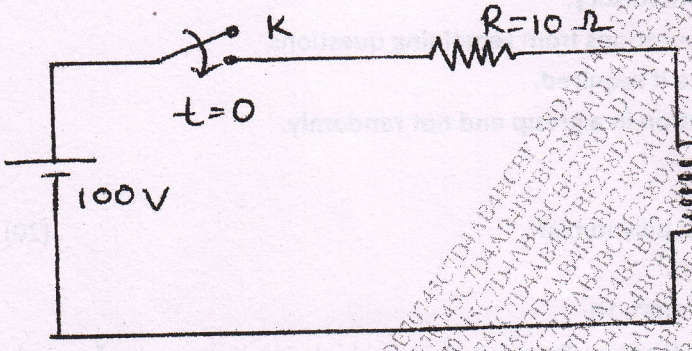
(b) Realise the following function in Cauer –I and Cauer-II forms.

$$Z(S) = \frac{(S+1)(S+3)}{S^2+2S}$$

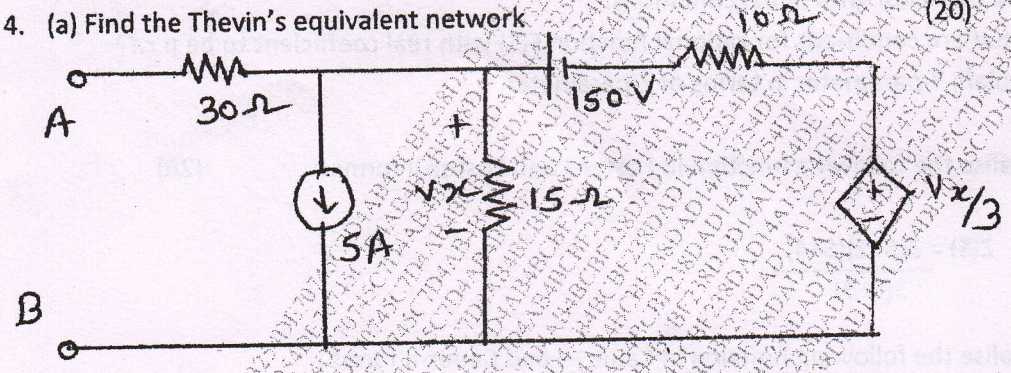
3. (a) Obtain hybrid parameter of the inter connected network. (20)



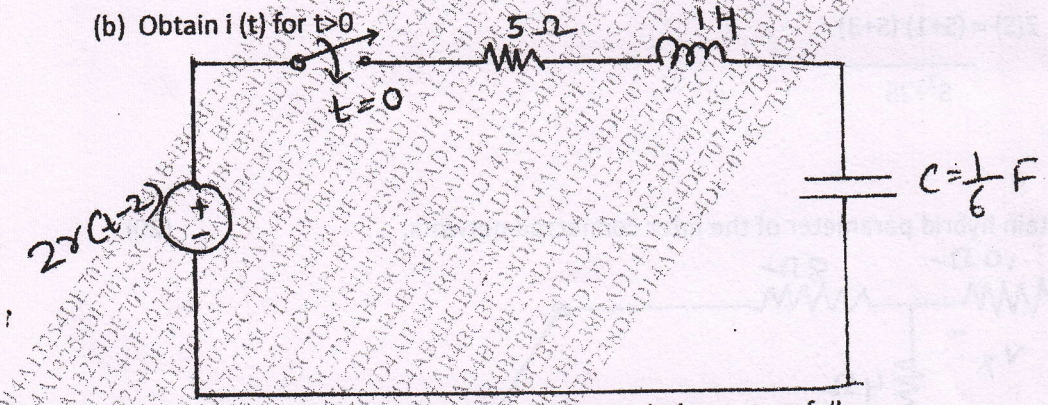
(b) The switch is closed at t=0, find values of I, $\frac{dI}{dt}$, $\frac{d^2I}{dt^2}$ at t=0+.Assume all initial current of inductor to be zero for circuit



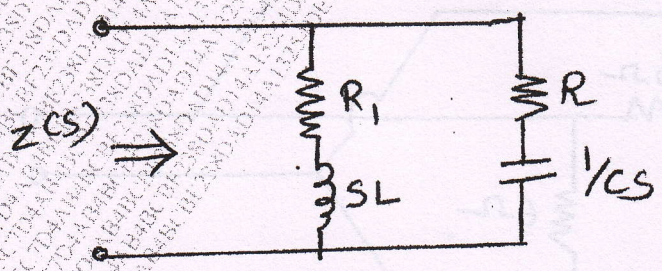
4. (a) Find the Thevin's equivalent network (20)



(b) Obtain i (t) for t>0



5. (a) The poles and zeros of the network shown below are as follows:
Poles at -1+j√5, -1-j√5, zeros at -1,-3 and the scale factor is K. If Z(0) = 1.Find the values of R,R_1,L and C.



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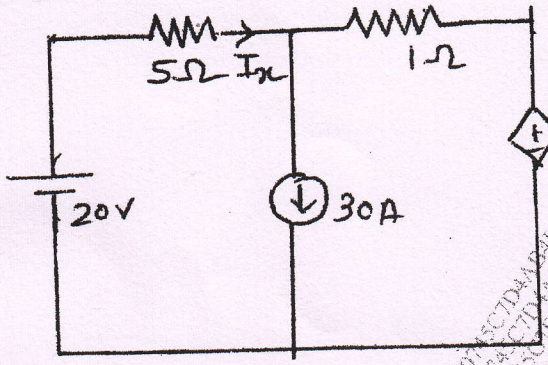
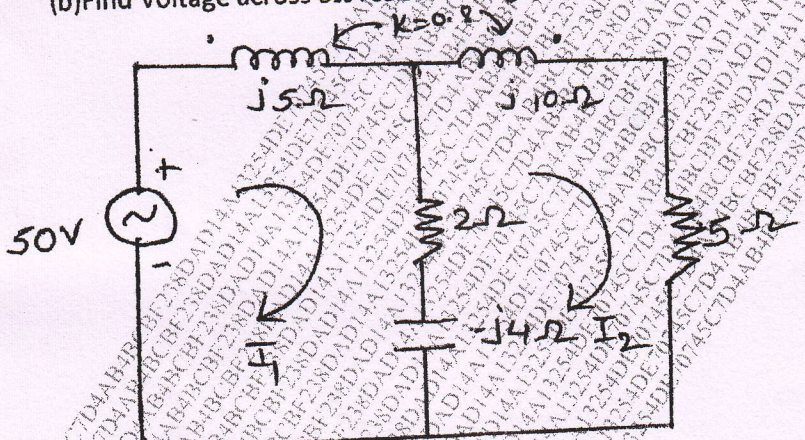
(b) Find the current Ix using superposition theorem.



6. (a) Check whether the following functions are prf or not:- (20)

$$F(S) = \frac{2S^4 + 7S^3 + 11S^2 + 12S + 4}{S^4 + 5S^3 + 9S^2 + 11S + 6}$$

(b)Find Voltage across 5Ω resistor using mesh Analysis.



SE | III | choice band | ETRX | Am-III | 08/05/18

Q.P. Code: 25013

(3 Hours) *Total Marks :80*

Note: 1) Question No.1 is compulsory
2) Attempt any Three from the remaining

Q1

A) Find Laplace transform of $\sin\sqrt{t}$ 5

B) Prove that $u = -r^3\sin 3\Theta$ is harmonic function also find harmonic conjugate function of u 5

C) Find a fourier series to represent $f(x) = \left(\frac{\pi-x}{2}\right)^2$ in $(0, 2\pi)$ hence deduce that 5

$$\frac{\pi^2}{6} = \frac{1}{1} + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \ldots\ldots$$

D) Find the acute angle between the surface $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at $(2,-1,2)$ 5

Q2

A) Prove that $J_{(-3/2)}(x) = -\sqrt{\frac{2}{\pi x}}\left(\frac{\cos x}{x} + \sin x\right)$ 6

B) Find the Bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = 0, 1, \infty$ 6

C) Obtain the fourier series for $f(x) = |x|$ in $(-\pi, \pi)$ 8

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1} + \frac{1}{9} + \frac{1}{25} + \ldots\ldots$

Q3

A) Find inverse laplace transform of (i) $2\tanh^{-1}(s)$ (ii) $e^{-4s}\cdot\frac{s}{(s+4)^3}$ 6

B) Find the image of the rectangular region bounded by $x=0, x=3, y=0, y=2$ under the bilinear transformation $w = z+(1+i)$ 6

C) Prove that $y = \sqrt{x}\,J_n(x)$ is a solution of the equation, 8

$$x^2\frac{d^2y}{dx^2} + \left(x^2 - n^2 + \frac{1}{4}\right)y = 0$$

Q4

A) Find Complex form of Fourier Series of $\cosh ax$ in $(-a, a)$ 6

B) Use Gauss's Divergence theorem to evaluate $\iint_S \bar{N}.\bar{F}\,ds$ where $\bar{F}=4xi+3yj-2zk$ and S is the surface bounded by $x=0, y=0, z=0$ and $2x+2y+z=4$ 6

C) Solve using Laplace transform $(D^2+2D+1)y = 3te^{-t}$, given $y(0)=4$ and $y'(0)=2$ 8

Q5

A Find half range cosine series for $f(x) = \begin{cases} x, & 0 < x < \left(\frac{\pi}{2}\right) \\ \pi - x, & \left(\frac{\pi}{2}\right) < x < \pi \end{cases}$ 6

B) Find inverse Laplace transform of $\frac{1}{(s^2+4s+13)^2}$ using convolution theorem 6

c) Prove that $\bar{F} = (y^2\cos x + z^3)i + (2y\sin x - 4)j + (3xz^2+2)k$ is a conservative field. Find (i) Scalar Potential for $\bar{F}$ (ii) The work done in moving an object in this field from $(0,1,-1)$ to $\left(\frac{\pi}{2}, -1, 2\right)$. 8

Q6

A) Find the Laplace Transform of $e^{-4t}\int_0^t usin3udu$ 6

B) Use stoke's theorem to evaluate $\int_C \bar{F}.\overline{dr}$ where $\bar{F}$ =(2x-y)i-yz^{2}j –y^{2}zk and S is the surface of hemisphere x^2 +y^2+z^2 =a^2 lying above the XY- plane 6

C) Express the function f(x) $=\begin{cases} 1 & , \ |x| < 1 \\ 0 & , \ |x| > 1 \end{cases}$ as Fourier integral .Hence evaluate 8

$\int_0^\infty \frac{sinw.sinwx}{w}\, dw$

SE | EXTC | DCD | Choice Based | Rev '17 | 22/5/18

Sub:- Digital Circuits and Design

Q.P. Code: 50080

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(3 Hours) [Total Marks : 80]

N.B. : (1) Question No. 1 is **Compulsory**.

(2) Attempt any **three** questions out of **remaining five**.

(3) Each question carries 20 marks and sub-question carry equal marks.

(4) Assume suitable data if required.

1. (a) Convert the following numbers as mentioned against them: (5)

(I) $(101011)_2$ convert to decimal number.

(II) Convert $(129.625)_{10}$ Hexadecimal form.

(III) Write $(-20)_{10}$ in Two's complement form.

(b) Write differences between synchronous and asynchronous counters. (5)

(c) Explain use of latch as a switch debouncer (5)

(d) Explain current and voltage parameters of logic families. (5)

2. (a) Simplify using Quine McCluskey method and draw the logic diagram using basic gates for the following function; (10)
$Y = F(A, B, C, D) = \Sigma m(5, 11, 13, 14, 15) + \Sigma d(4, 6, 7)$.

(b) Draw four bit Ring counter and explain its operation. (10)

3. (a) Implement the following function using only one 4:1 multiplexer and gates; (10)

$$Y=F(A,B,C,D) = \Sigma m(2, 3, 5, 7, 10, 11, 12, 13)$$

(b) Design 3 bit look ahead carry generator circuit. (10)

4. (a) Draw circuit diagram of 2 input TTL NAND gate and explain its operation. (10)

(b) Implement full adder using decoder having active low outputs and gates with fan in 2. (10)

5. (a) Design lockout free mod 10 up synchronous counter using JKMS flip flops. (10)

(b) Explain parity circuits. (10)

6. (a) Convert the flip flop (I) JKMS to D flip flop (II) SR to T flip flop. (10)

(b) Design 8 bit comparator using 4 bit comparator IC 7485 and explain its operation. (10)

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SE, sem. III, Electronics, FH2018 16/05/18

Choicebase

E.D.C-I

Sub:- Electronics Devices & Circuits-I

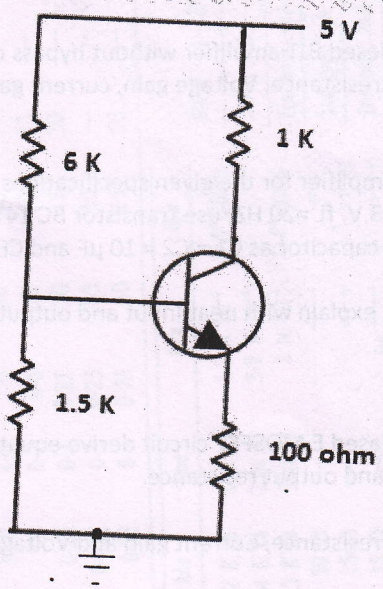
Q.P. Code: 36426

(3 Hours)

Maximum Marks 80

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

		Marks
Que-1	Solve **any Four**	
a	What happens when pn junction diode is made forward bias, explain considering any suitable application.	5
b	Explain how CC configuration of BJT gives voltage gain less than 1	5
c	Explain with the help of construction that MOSFET gives more Input resistance than JFET	5
d	What is varactor Diode, also state its applications.	5
e	Compare C, L and LC filters.	5
Que-2a	Draw Energy band diagram of pn junction diode under i) Zero Bias ii) Forward bias and iii) Reverse Bias	10
Que-2b	For the given circuit find Steady State DC Parameters Icq and Vceq Given **β = 100** and **VBE = 0.7 V**, also state in which region the circuit is working.	10



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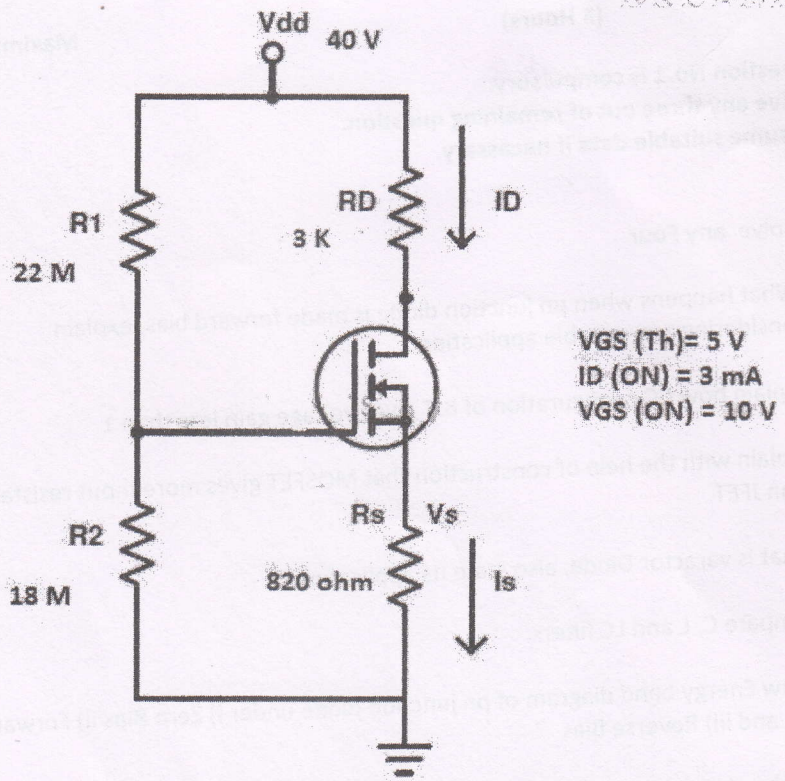
Que-3a For the given MOSFET amplifier , Determine IDq, VGSq and VDS. 10



Que-3b Explain working principle, characteristics and applications of Photodiode. 10

Que-4a What is the need of Filters, Explain L filter circuit? 10

Que-4b For the voltage divider biased BJT amplifier without bypass capacitor circuit derive equation of Input resistance, Voltage gain, current gain and output resistance. 10

Que-5a Design Single Stage CE amplifier for the given specifications 15
Av ≥ 100, S =10, Vo = 3 V, fL =20 HZ, use transistor BC 147 B
Use coupling and bypass capacitor as C1 = C2 = 10 µF and CE = 100 µF.

Que-5b What is Clamping circuit, explain with neat Input and output waveforms for negative Clamping circuit. 05

Que-6a For the voltage divider biased E MOSFET circuit derive equation of Input Resistance, Voltage gain and output resistance. 10

Que-6b Derive equation of Input resistance, Current gain and Voltage gain for CC amplifier. 10

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DBEC DATA SHEET

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_{CER} (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 h_{fe} min.	typ.	max.	V_{BE} max.	θ_{j-c} °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
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_{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