SE | Sem-III (CBSGS) | ETRX, INST / EXTC | Applied Mathematics - III | Nov. 16

Q. P. Code : 547400

DURATION: 3 HRS. **MAX. MARKS:80**

1) Question No. **1** is compulsory.
2) Attempt any **THREE** of the remaining.
3) **Figures** to the **right** indicate **full** marks.

Q.1 A) Determine the constants a, b, c, d, e if

$f(z) = (ax^4 + bx^2y^2 + cy^4 + dx^2 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is analytic. (5)

B) Find half range Fourier sine series for $f(x) = x^2$, $0 < x < 3$. (5)

C) Find the directional derivative of $\varphi(x, y, z) = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the vector $i + 2j + 2k$. (5)

D) Evaluate $\int_0^\infty e^{-2t} t^5 \cosh t \; dt$. (5)

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

B) If $f(z) = u + iv$ is analytic and $u - v = e^x(\cos y - \sin y)$, find f(z) in terms of z. (6)

C) Obtain Fourier series for $f(x) = x + \frac{\pi}{2} \quad -\pi < x < 0$

$= \frac{\pi}{2} - x \quad 0 < x < \pi$

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$ (8)

Q.3 A) Show that $\bar{F} = (2xy + z^3)i + x^2j + 3xz^2k$, is a conservative field. Find its scalar potential and also find the work done by the force $\bar{F}$ in moving a particle from (1,-2,1) to (3,1,4). (6)

B) Show that the set of functions $\{\sin(2n+1)x\}, n = 0,1,2, \ldots$ is orthogonal over $[0, \pi/2]$. Hence construct orthonormal set of functions. (6)

[TURN OVER]

C) Find (i) $L^{-1}\{\cot^{-1}(s+1)\}$

(ii) $L^{-1}\left(\frac{e^{-2s}}{s^2+8s+25}\right)$ (8)

Q.4) A) Prove that $\int J_3(x)\,dx = -\frac{2J_1(x)}{x} - J_2(x)$ (6)

B) Find inverse Laplace of $\frac{s}{(s^2+a^2)(s^2+b^2)}$ $(a \neq b)$ using Convolution theorem. (6)

C) Expand $f(x) = xsinx$ in the interval $0 \leq x \leq 2\pi$ as a Fourier series.

Hence, deduce that $\sum_{n=2}^{\infty} \frac{1}{n^2-1} = \frac{3}{4}$ (8)

Q.5) A) Using Gauss Divergence theorem evaluate $\iint_S \bar{N}.\bar{F}ds$ where $\bar{F} = x^2i + zj + yzk$

and S is the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1 (6)

B) Prove that $J_2'(x) = \left(1 - \frac{4}{x^2}\right)J_1(x) + \frac{2}{x}J_0(x)$ (6)

C) Solve $(D^2+3D+2)y = 2(t^2+t+1)$, with y(0)= 2 and y'(0)= 0 (8)
by using Laplace transform

Q.6) A) Evaluate by Green's theorem for $\int_c (e^{-x}siny\,dx + e^{-x}cosy\,dy)$ where C is the

the rectangle whose vertices are (0,0), $(\pi, 0)$, $(\pi, \pi/2)$ and $(0, \pi/2)$ (6)

B) Show that under the transformation $w = \frac{z-i}{z+i}$, real axis in the z-plane is mapped onto the circle $|w| = 1$ (6)

C) Find Fourier Sine integral representation for $f(x) = \frac{e^{-ax}}{x}$ (8)

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#INST/Sem-III(CBSGS)/Electrical Network Analysis & Synthesis / NOV-16.

QP Code : 551001

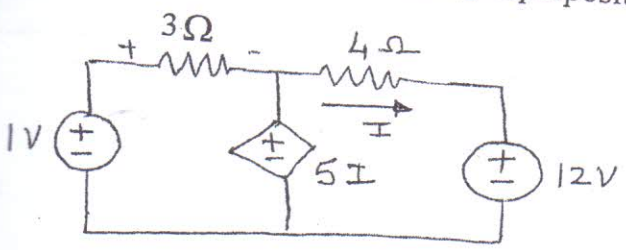
(3 Hours)

[Total Marks : 80

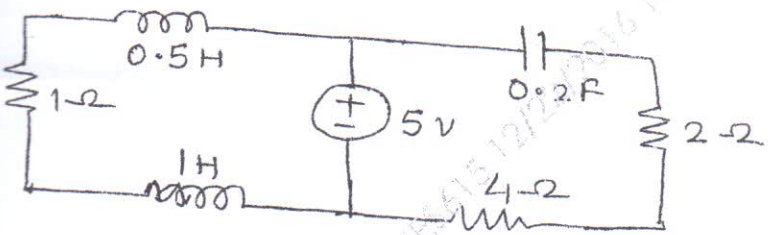
N.B. : (1) Question **No. 1** is Compulsory.
(2) Attempt **any three** questions from remaining **five** questions.

1. Attempt any **four** :

(a) Find V_x in the circuit shown using superposition theorem. **20**



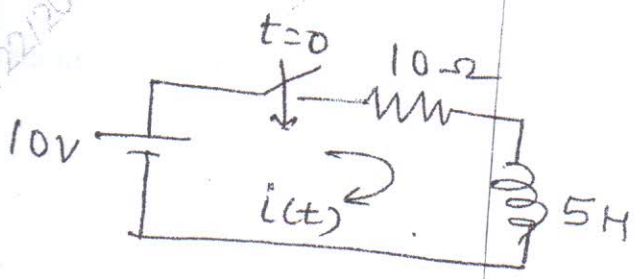
(b) Obtain dual of given network



(c) Test whether Hurwitz or not
$P(s) = s^5+12s^4+45s^3+60s^2+44s+48$

(d) In the given network, switch is closed at $t = 0$, with initial conditions = 0 ; find

$i, \frac{di}{dt}, \frac{d^2i}{dt^2}$ at $t = 0^+$



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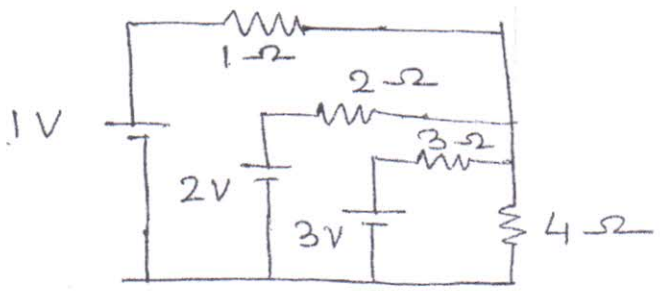
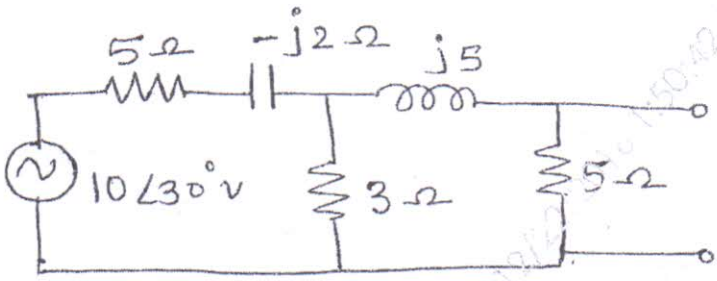
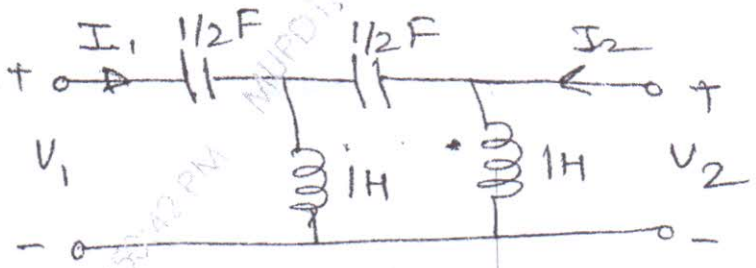
(e) Find $I_{4\Omega}$ using Nodal Analysis.



2. (a) Find thevenin's equivalent network for the shown network. 10

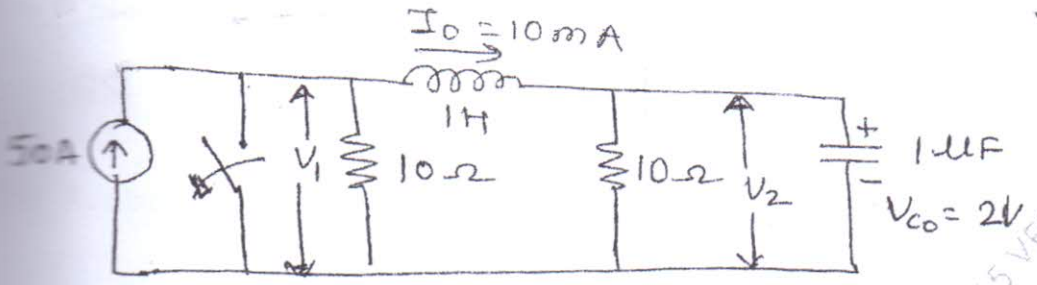


(b) Find Y - parameters for the given network. 10



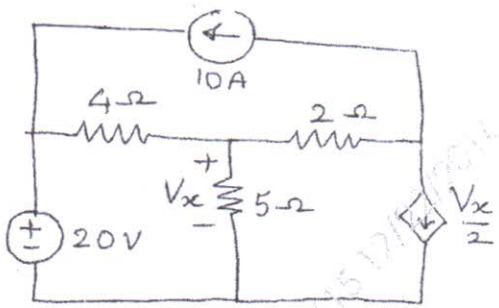
3. (a) For the network given below, switch is opened at t = 0 with initial conditions as shown. find the values of 10

$$V_1, V_2, \frac{dv_1}{dt}, \frac{dv_2}{dt} \text{ at time } t = 0^+$$



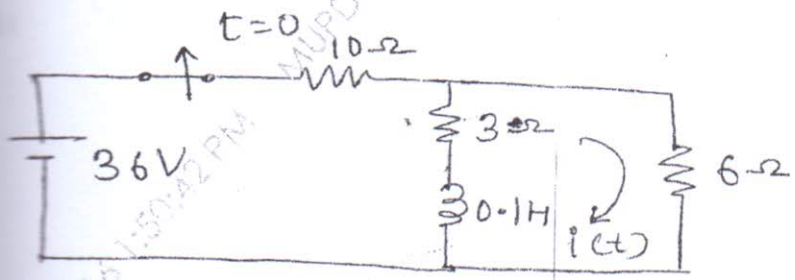
(b) Find Vx

10

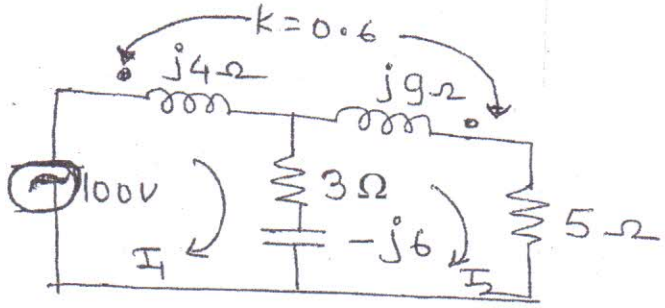


(a) In the network ; the switch is opened at t = 0 ; find i (t) .

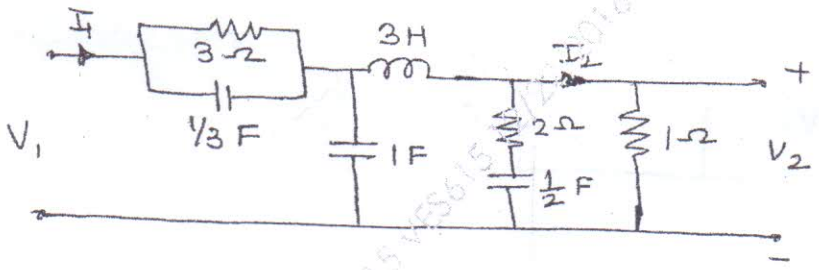
10



(b) For the network det. I_1 and I_2 10



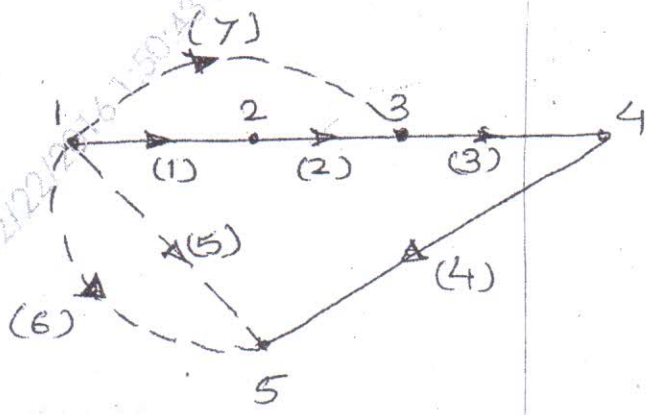
5. (a) Determine, $\frac{V_2}{V_1}$, and $\frac{I_2}{I_1}$ 10



(b) For the given tree find 10

(i) Incidence matrix and

(ii) Cutset Matrix



(a) Check for positive realness

$$F(S)=\frac{2S^2+2S+1}{S^3+2S^2+s+2}$$ 10

(b) Realize the following functions using Foster I and Foster -II forms

$$z(s)=\frac{(s+1)(s+3)}{S(s+2)(s+4)}$$ 10

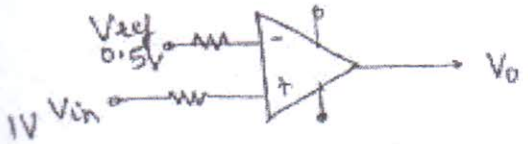
E/INST/SEM-III (CBSGS)/Analog Electronics/Nov-16.

Q.P. Code : 550900

(3 Hours) **[Total Marks : 80**

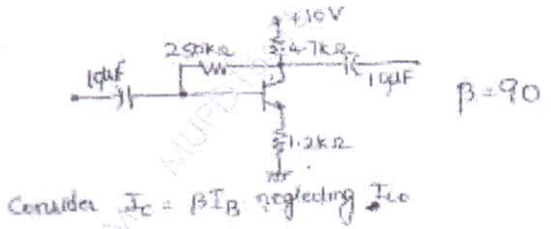
N.B. : (1) Question No. 1 is **compulsory** based on entire syllabus.
(2) Solve **any THREE** main questions out of remaing.

1. Answer **any four** : **20**
   a) What is the Shockley's equation in FET?
   b) Draw the output of following comparator. Explain its operation. Reference voltage is 0.5V. Input is sine wave of 1V peak.

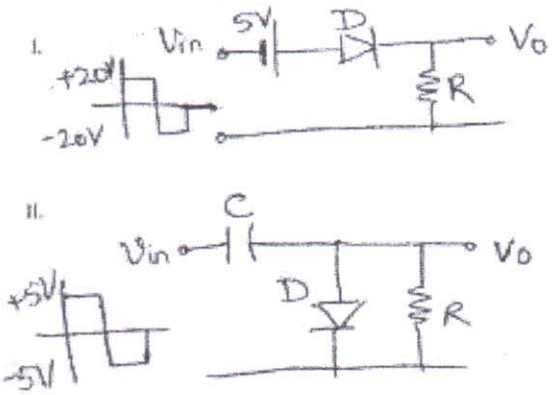


   c) Compare CB CE and CC configurations.
   d) What are the characteristics of an Ideal Op-Amp?
   e) Draw the circuit of Log amplifier and explain.

2. Answer the following :-
   a) Perform DC analysis and detemine voltage V_{CEQ} and the current is I_B, I_C. **10**
   $R_C = 4.7K$, $R_E = 1.2K$, $R_B = 250K$, $V_{CC} = 10V$.



   b) Detemine the output of following : **10**



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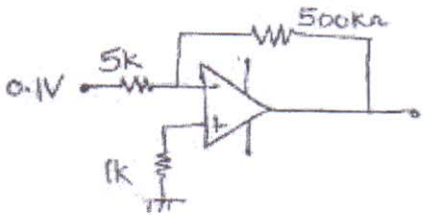
3. Answer the following :
   a) Draw the circuit and find frequency of oscillation for Wein Bridge oscillator. Explain its operation.
   b) Draw and explain the circuit of integrator and differentiator using op-amp.

4. Answer the following :-
   a) Draw the output of following op-amp circuits.

i.



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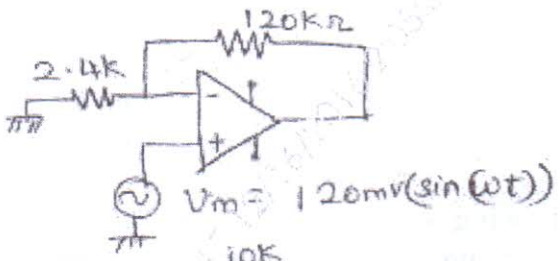

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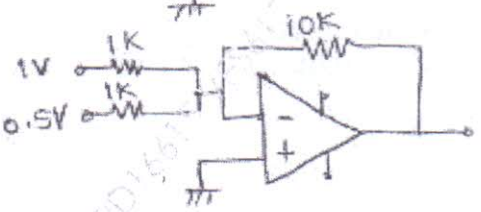
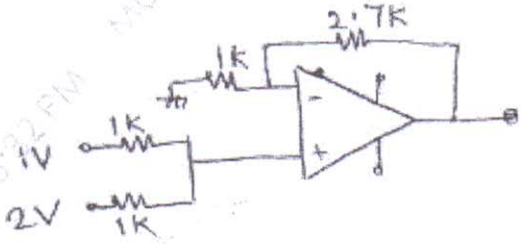
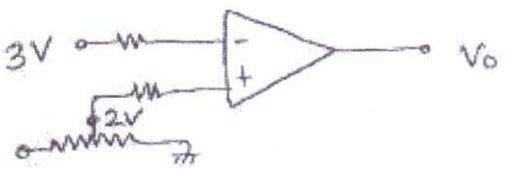


iv.



v.

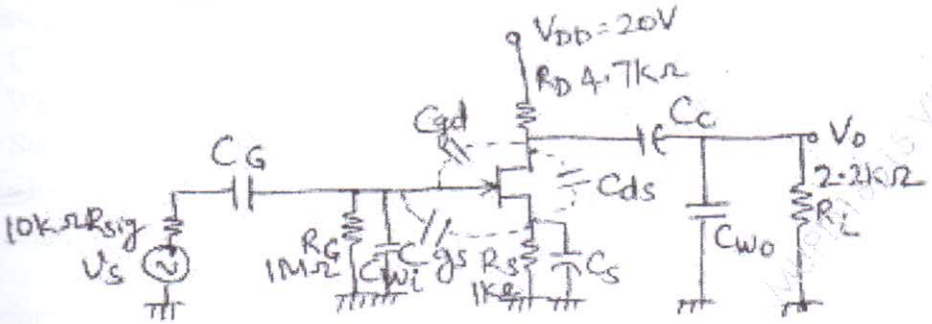


   b) Explain the working of JFET. Draw the characteristics (graphs)

10

5. Answer the following :-

a) Determine the lower cutoff and higher cutof frequency for high frequency circuit as shown. **10**



$C_G = 0.01\ \mu F$	C gd = 2 pF	Cwo = 6 pF	$I_{DSS} = 8mA$
$C_C = 0.5\ \mu F$	Cgs = 6 pF	Cwi = 5 pF	Vp = 6 V
$C_S = 2\ \mu F$	Cds = 0.5 pF	Av = -3	Rd = ∞

b) Draw and explain CLASS B Power amplifier. **10**

6. Answer the following :

a) Draw and explain the circuit of series regulator. **10**

b) Why is the potential divider biasing circuit best in BJT? Explain with an example. **10**

SEM - III | INST | Digital Electronics | Nov-16
CBSGS

Q. P. Code : 550601

(3 Hours) **(Total Marks : 80)**

N.B. (1) Question no 1 is compulsory.
(2) Attempt any three questions from the remaining questions
(3) Figures to the right indicate full marks.
(3) Assume suitable data wherever necessary.

1. Answer the following (**any four**) **20**
(a) Convert: (i) $(21D.2F)_{16}$ to $(?)_{10}$. (ii) $(67)_{10}$ to $(?)_{BCD}$.
(b) What is a debounce switch? Why is it used in digital switching circuits? Explain.
(c) State and prove DeMorgan's theorems.
(d) Design half subtractor using logic gates.
(e) Simplify with k-map & implement with logic gates $f = \Sigma m\,(2, 3, 4, 5, 12, 13)$.

2. Perform. **20**
(a) Perform the following:-
(i) Subtract $(CB2)_{16}$ & $(972)_{16}$ use the 16's complements method.
(ii) Write the Hamming code for data 1101.
(b) Simplify using Boolean laws & implement with logic gates.
(i) $f = \overline{A}BCD + A\overline{B}CD + \overline{A}B\overline{C}D + \overline{A}BC\overline{D}$
(ii) $f = (\overline{AB.(\overline{C+D})}).(\overline{AB})$

3. (a) Convert SR flip flop to D flip flop & TFF. **10**
(b) Design & implement with gates a parity generator circuit for odd parity. **10**

4. (a) Design a MOD-6 ripple counter using JKFF draw o/p waveforms for each flip flop. **10**
(b) Design & implement a full odder circuit using a 3:8 Decode. **10**

5. (a) Explain with a neat diagram working of SISO shift register. Draw necessary timing diagram. **10**
(b) Simplify following using k-map & implement using logic gates. **10**
$f = \Sigma m(0,3,5,7,8,11,12,15)+d(2,13)$

6. Write a short notes on:- (any four) **20**
(1) ALU
(2) Dynamic RAM cell.
(3) PAL & PLA.
(4) FPGA
(5) Schottky clamped TTL.

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BE/INST / Sem-III (CBSGS) / Transducers - I / Nov-16

Q.P. Code : 550802

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No.1 is compulsory.
(2) **Attempt** any **three** out of remaining.
(3) Figures indicate to the **full** marks.
(4) Assume suitable data if necessary.

1. Answer the following. **20**
   a) What is solid level detector?
   b) Define i) Accuracy ii) Sensitivity
   c) Explain working principle of i) Piezo electric transducers ii) Piezo resistive transducers.
   d) Find seebeck voltage for a thermocouple with proportionality constant of 40μV/°C If the junction temperature are 40°C and 80°C.
   e) Explain the working principle of bimetallic thermometer.

2. a) Define error. Explain the classification of error and it's causes. **10**
   b) A voltmeter having a sensitivity of 1000 Ω/V reads 100 V on its 150 V scale when connected across an unknown resistor in series with milli ammeter when it reads 5 mA, Calculate **10**
      i) Actual resistance of the unknown resistor.
      ii) Error due to loading effect of voltmeter.

3. a) Explain any five static characteristics of transducer with suitable examples. **10**
   b) What is the need of lead wire compensation? How it is to be done in RTD? What is self heating effect in RTD? **10**

4. a) For a certain thermistor β = 3140 K and at 27°C is known to be 1050 Ω. The thermistor is used for temperature measurement and the resistance measured is as 2330 Ω. Find the measured temperature. **10**
   b) Draw set up and explain the working of air purge method of level measurement. **10**

5. a) Explain in detail radioactive type level detector. **10**

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b) A capacitive transducer uses two quartz diaphragm of area 750 mm^2 separated by a distance of 3.5 mm. A pressure of 900 KN/m^2 when applied to top diaphragm produces a deflection of 0.6 mm. The capacitance is 370pF when no pressure is applied to the diaphragm. Find the value of capacitance after the application of pressure 900 KN/m^2. 10

6. Write short notes **(any two)** :- 20

a) Optical pyrometer

b) Rotary encoder

c) Cold junction compensation & thermopiles.
