G 1983 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2010

Third Semester

Branch : Electronics and Communication, Applied Electronics and Instrumentation
Electronics and Instrumentation Engineering

SOLID-STATE DEVICES (L A S)

(Prior to 2007 admisisons—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Distinguish clearly between electron current and hole current.
2. Sketch the energy band diagrams for *n*-type and *p*-type semiconductors and label them.
3. Sketch the charge density and potential distribution across an abrupt *pn*-junction.
4. Distinguish between Zener and Avalanche breakdown giving their typical range of values.
5. Explain the tunnelling phenomena and its applications.
6. Distinguish between the photodiode and LED.
7. Sketch the characteristics of a phototransistor and explain.
8. If the base of the transistor is heavily doped, explain what will happen to its (i) base current ; (ii) α ?
9. Distinguish between pinch-off and threshold in FET.
10. E-MOSFET is called a "normally-off-MOSFET". Explain why ?

(10 × 4 = 40 marks)

Part B

Answer **either** *section (a)* **or** *(b) of each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Define and explain mobility and conductivity. With necessary diagrams and equations, explain the dependence of the above two in a semiconductor on temperature.

(12 marks)

Or

(b) (i) With the help of necessary energy band diagrams, contrast between direct and indirect band gap semiconductors.

(6 marks)

(ii) Explain Hall effect used to determine the mobility of a hole in a semiconductor.

(6 marks)

Turn over

Module 2

12. (a) Sketch all the current components in a forward biased *pn* junction and with necessary equations, explain them.

Or

(b) Explain both types of capacitances in a *pn* junction at forward and reverse bias conditions. Derive expressions for them.

(12 marks)

Module 3

13. (a) With neat constructional diagram, explain the working of a Zener diode in the breakdown region. Sketch the VI characteristics in forward and reverse bias and account for the dynamic resistance in various portions in it.

(12 marks)

Or

(b) (i) Draw and explain the piecewise linear approximated VI characteristics of a rectifier diode in both the bias conditions.

(6 marks)

(ii) With constructional details, explain the working of a LED. (6 marks)

Module 4

14. (a) With the help of neat carrier profile, in a *npn* transistor biased in saturation region describe the various current components in it, with the help of necessary equations.

Or

(b) Draw the input and output characteristics of a common emitter *pnp* transistor, and explain the shape with the help of early effect.

(12 marks)

Module 5

15. (a) Draw the constructional diagram of a JFET and explain its drain and transconductance characteristics using the above.

Or

(b) Sketch the constructional details of a MOS capacitor and explain the CV characteristics.

(12 marks)

[5 × 12 = 60 marks]

G 1997 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2010

Third Semester

Branches : Electronics and Instrumentation, Applied Electronics and Instrumentation Electronics and Instrumentation Engineering

COMPUTER PROGRAMMING (LAS)

(Prior to 2007 admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C programs wherever necessary.

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Write the C equivalent expression for $\sin\left[\frac{y}{\sqrt{x^2+y^2}}\right]+\frac{\alpha+\beta}{\sin z}+|x|$.
2. What is an escape sequence ? Give example and explain the purpose of the same.
3. What will be the output of the following program ?

```
main ( )
{
int x = 5 ;
while (X = = 1)
x = x – 1 ;
printf ("%d\n", x) ;
}
```

4. What are the different types of functions supported by C ? Give examples for each one.
5. What is a Union ? How does it differ from a structure ? What are its merits ?
6. What is a (i) structure tag ; (ii) structure variable ? Write their differences and purposes.
7. How do you declare and manipulate single and two dimensional arrays using pointers ?
8. Distinguish between call by value and call by reference.
9. Name and explain any *four* I/O file functions.
10. What is a preprocessor ? Explain the various preprocessor directives.

(10 × 4 = 40 marks)

Turn over

Part B

Answer **either** *Section (a)* **or** *(b) from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) (i) Earth takes a period of revolution of 31558150 seconds. Write a C program to convert this into number of days, hours and minutes.

(6 marks)

(ii) Write a C program to exchange the values of variables A and B without using a temporary variable.

(6 marks)

Or

(b) (i) Mention the various conversion specifications for data I/O in C. (6 marks)

(ii) What is the conditional operator ? Give the syntax and explain with an example.

(6 marks)

Module 2

12. (a) Write a C program to convert a given binary number into its equivalent decimal number.

(12 marks)

Or

(b) Write a function to reverse a given string and use it to check whether the given string is a palindrome.

(12 marks)

Module 3

13. (a) Define a structure that describes the set of books in a library. For each book, the members are name of author, publisher, rate and branch information. Write a program to print

(i) a list of books supplied by a publisher.

(ii) a list of books in a particular branch.

(12 marks)

Or

(b) Given two one-dimensional arrays A and B. Read them and sort in ascending order. Then merge them into a single sorted array C that contains every item from arrays A and B in ascending order.

(12 marks)

Module 4

14. (a) Write a C program using pointers to find the longest word in a given sentence. (12 marks)

Or

(b) Write a C program using pointers to add two matrices of order $m \times n$. (12 marks)

Module 5

15. (a) A student master file consists of the register number, name and marks in 8 subjects. Write a C program which will read the file and print a list of students who have failed in one or more subjects. The pass mark required is 40 % in each subject.

(12 marks)

Or

(b) What is a macro ? Write a macro that converts a character to uppercase if it is a lowercase letter and leaves it unchanged otherwise.

(12 marks)

[5 × 12 = 60 marks]

G 1975 **(Pages : 3)** **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2010

Third Semester

Branch : Electronics and Communication, Applied Electronics and Instrumentation
Electronics and Instrumentation Engineering

ELECTRICAL TECHNOLOGY (L A S)

(Prior to 2007 admisisons—Supplementary)

Time : Three Hours **Maximum : 100 Marks**

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Explain the magnetization characteristics of a d.c. generator.
2. Define and explain (i) critical resistance and (ii) critical speed of a d.c. generator.
3. Explain with a neat sketch, the three point starter.
4. Explain the significance of back e.m.f. in a d.c. motor. How it is developed ?
5. How do the different losses in a transformer vary with load ? Explain.
6. Write down an expression for the maximum efficiency of a transformer in terms of rated volt-ampere and full-load losses.
7. Define slip. Why cannot an induction motor run at synchronous speed ?
8. What do you understand by armature reaction in an alternator ? Discuss the effect of armature reaction in case of purely inductive load.
9. Describe the working principle of synchro. What are its applications ?
10. Explain the working principle of an electromagnetic relay.

(10 × 4 = 40 marks)

Part B

Answer **either** *section (a)* **or** *(b) from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) A d.c. series generator is running at 750 r.p.m. and is supplying a load of 6 kW at 120 V. The speed is increased to 1200 r.p.m. and load is increased to 9 kW. The sum of armature and field resistance is 0.4 Ω. Calculate the new value of armature current and terminal voltage. Neglect the armature reaction.

(12 marks)

Or

Turn over

(b) (i) Explain OCC of a d.c. generator. Explain how it is obtained. What information the OCC gives regarding self excitation of a d.c. generator ?

(8 marks)

(ii) Explain armature reaction and its effect in a dc generator. (4 marks)

Module 2

12. (a) The armature winding of a 4 pole, 250 V d.c. shunt motor is lap connected. There are 120 slots, each slot containing 8 conductors. The flux per pole is 20 mWb and the current taken by the motor is 25 A. The resistances of armature and field circuit are 0.1 Ω and 125 Ω respectively. If the rotational losses are 800 W, calculate the developed torque and useful torque of the machine.

(12 marks)

Or

(b) (i) The power input to a 230 V d.c. shunt motor is 8.477 kW. The field and armature resistances are 230 Ω and 0.28 Ω respectively. Calculate the input current, armature current and back e.m.f.

(6 marks)

(ii) Describe how Swinburne's test is carried out on a d.c. motor. How efficiency is obtained ?

(6 marks)

Module 3

13. (a) A 500 kVA transformer has constant loss of 500 W and the copper losses at full-load are 600 W. Determine the load at which the efficiency is maximum. Also find the efficiency at (i) full-load ; (ii) half full-load at unity and 0.8 p.f.

Or

(b) A 250/5000 V transformer gave the following observations :—

SC test : with lv winding short 20 V, 12 A, 100 W

OC test : 250 V, 1 A, 80 W on lv side.

Determine the circuit constants, insert them on the equivalent circuit diagram and calculate applied voltage and efficiency when the output is 10 A at 500 V and 0.8 p.f. lagging.

(12 marks)

Module 4

14. (a) A 3-phase induction motor has a synchronous speed of 250 r.p.m. and 4 % slip at full-load. The rotor has a resistance of 0.02 Ω per phase and a standstill leakage reactance of 0.15 Ω per phase. Calculate (i) the ratio of maximum and full-load torque ; (ii) the speed at which the maximum torque is developed. Neglect resistance and leakage of the stator winding.

Or

(b) Calculate the speed and open circuit line and phase voltages of a 4 pole, 3-phase, 50 Hz, star-connected alternator with 36 slots and 30 conductors per slot. The flux per pole is 0.05 Wb sinusoidally distributed.

(12 marks)

Module 5

15. (a) With neat diagrams, explain the constructional features of Universal motor. What are the different functions performed ? Explain its applications.

Or

(b) Describe the constructional details and working of a tachogenerator. What are its advantages ?

(12 marks)

[5 × 12 = 60 marks]

G 1962 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2010

Third Semester

Branches : Civil, Mechanical, Electrical and Electronics, Electronics and Communication, Applied Electronics and Instrumentation, Instrumentation and Control, Electronics and Instrumentation, Automobile Engineering

ENGINEERING MATHEMATICS—II (CMEPLANSU)

(Prior to 2007 admissions)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

Answer **one** *full question from each module.*
Each full question carries 20 *marks.*

Module 1

1. (a) Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at (2, – 1, 2) in the direction of $2\vec{i} - 3\vec{j} + 6\vec{k}$. (5 marks)

(b) Find the value of λ if the vector $\left(\lambda x^2 y + yz\right)\hat{i} + \left(xy^2 - xz^2\right)\hat{j} + \left(2xyz - 2x^2y^2\right)\hat{k}$ has zero divergence. Also find the curl of the above vector when it has zero divergence. (8 marks)

(c) If n is a non-zero constant, show that $\nabla^2 r^n = n(n+1)\, r^{n-2}$. (7 marks)

Or

(d) $\vec{V} = \vec{w} \times \vec{r}$, where $\vec{w}$ is a constant vector show that, $\vec{w} = \frac{1}{2}\text{curl } \vec{V}$. (5 marks)

(e) If U and V are differentiable scalar fields, prove that $\nabla U \times \nabla V$ is solenoidal. (8 marks)

(f) If $r = |\vec{r}| = \sqrt{x^2 + y^2 + z^2}$, prove that $\nabla f(r) = \frac{\vec{r}}{r} \cdot \frac{df}{dr}$ and hence find ∇r^n. (7 marks)

Module 2

2. (a) Find the total work done in moving a particle in a force field : $f = 3xy\,\vec{i} + y\vec{j} + 2xz\,\vec{k}$ once round the circle in the xy-plane whose centre is at the origin and radius equal to 2 units. (5 marks)

(b) Using divergence theorem, prove that $\iiint_V \nabla\phi\, dV = \iint_S \phi \cdot \bar{n}\, dS$. (15 marks)

Or

(c) Using Green's theorem in the plane, evaluate $\oint_C \left(3x^2 - 8y^2\right) dx + (4y - 6xy)\, dy$ where C is the boundary of the region enclosed by $y = \sqrt{x}$ and $y = x^2$.

(15 marks)

(d) Find $\int_C \bar{A} \cdot d\bar{r}$ along the curve C defined by $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from $t = 1$ to $t = 2$, where $\bar{A} = 3xy\,\hat{i} - 5z\,\hat{j} + 10x\,\hat{k}$.

(5 marks)

Module 3

3. (a) Show that $z\bar{z}$ is differentiable but not analytic at the point $z = 0$. (5 marks)

(b) Obtain the Cauchy-Riemann equations of a function $f(z) = u(x, y) + iv(x, y)$ in Cartesian form.

(7 marks)

(c) If u and v are harmonic functions, show that $u_y - v_x + i\left(u_x + v_y\right)$ is analytic function.

(8 marks)

Or

(d) If $f(z) = u + iv$ is analytic function, prove that $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$ and $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$. (5 marks)

(e) Discuss the transformation $w = \sin z$. Find the mappings of $z = a$ and $y = b$ in the z-plane to the w-plane.

(7 marks)

(f) Find the bilinear transformation which maps $z = 0, -i, -1$ to $W = i, 1, 0$ respectively.

(8 marks)

Module 4

4. (a) Using divided difference interpolation formula find the cubic polynomial that approximates y. The table of corresponding values of x and y is given below :

x :	0	1	2	5
y :	2	3	12	147

(10 marks)

(b) Using Stirling's formula, find $f(28)$ from the following data :—

x :	20	25	30	35	40
$f(x)$:	49225	48310	47232	45284	44305

(10 marks)

Or

(c) Applying Newton's backward difference formula, obtain a polynomial of degree 4 in x :

x :	1	2	3	4	5
y :	1	−1	1	−1	1

(10 marks)

(d) In the table below, the values of y are consecutive terms of a series of which 36.2 is the 7th term. Evaluate the first and tenth terms of the series :

x :	3	4	5	6	7	8	9
y :	4.8	8.4	14.4	23.3	36.2	50.8	71.4

(10 marks)

Module 5

5. (a) Calculate the value of $\int_0^{\pi/2} \sin x\, dx$ by (i) Trapezoidal rule ; (ii) Simpson's $\frac{1}{3}$ rule, using 11 ordinates, in both cases.

(12 marks)

(b) A curve is drawn to pass through the points given by the following table :—

x :	1	1.5	2	2.5	3	3.5	4
y :	2	2.2	2.7	2.8	3	2.5	2.1

Estimate the area bounded by the curve, z-axis and the lines $x = 1$, $x = 4$.

(8 marks)

Or

(c) A rod is rotating in a plane. The following table gives the angle θ in radians through which the rod has turned for various values of the time t second :

t :	0	0.2	0.4	0.6	0.8	1.0	1.2
θ :	0	0.12	0.44	1.12	2.02	3.40	4.67

Calculate the angular velocity and the angular acceleration of the rod, when $t = 0.6$ second.

(12 marks)

(d) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's rule taking $h = \frac{1}{4}$. Hence compute an approximate value of π.

(8 marks)

[5 × 20 = 100 marks]

G 1990 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2010

Third Semester

Branch : Electronics and Communication, Applied Electronics and Instrumentation and Electronics and Instrumentation

ELECTRONIC CIRCUITS—I (L, A, S)

(Prior to 2007 admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Compare HWR, centre tapped rectifier and bridge circuit on the basis of their r, η and TUF.
2. With the help of a circuit diagram, explain the principle of short circuit protection.
3. Show, how from the output characteristics the h_{oe} can be calculated.
4. Sketch the deflection region in a JFET at pinch-off condition and explain its shape.
5. Usually A.C., load line is more steep than D.C. load line. Why ?
6. Write the expressions for the stability factor of voltage divider bias and emitter feedback bias amplifiers and comment which is more stable.
7. Draw the phase response characteristics of RC coupled amplifier and explain the reasons for the shape.
8. Compare and contrast the performances of self biased and potential divided bias FET amplifiers.
9. Draw the circuit of RC integrator and explain how it can integrate an input.
10. Explain how the UJT exhibits negative resistance.

(10 × 4 = 40 marks)

Part B

Answer **either** *section (a)* **or** *(b) in each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Draw the complete circuit diagram of a bridge rectifier with C filter. Explain the working with the help of necessary waveforms. Derive expression for the ripple factor.

Or

(b) Draw and explain the working of a series pass voltage regulator with feedback and short circuit protection.

(12 marks)

Turn over

Module 2

12. (a) Starting from fundamentals, derive the low frequency *h*-parameter equations and the equivalent circuit model for the common base transistor.

(12 marks)

Or

(b) (i) Draw the circuits of CE and CC configurations subject to the restriction that the input is open circuited. Show that the output impedances of the two are equal.

(6 marks)

(ii) Draw the low frequency equivalent circuit of a FET and give typical values of its parameters.

(6 marks)

Module 3

13. (a) A potential divider bias RC coupled CE amplifier has R_1 = 15 K, R_2 = 100 K, R_c = 4.7 K, R_E = 1 K, $C_1 = C_2$ = 10 μF, C_E = 470 μF, R_L = 800 Ω, R_S = 600 Ω, V_{CC} = 10 V. If β = 100, h_{ie} = 1 K, draw the AC and DC load lines and Q-point of the above circuit.

Or

(b) Draw the circuit diagram of an Emitter feedback bias amplifier and qualitatively explain how the Q-point is stabilised. Derive its S_I and justify.

(12 marks)

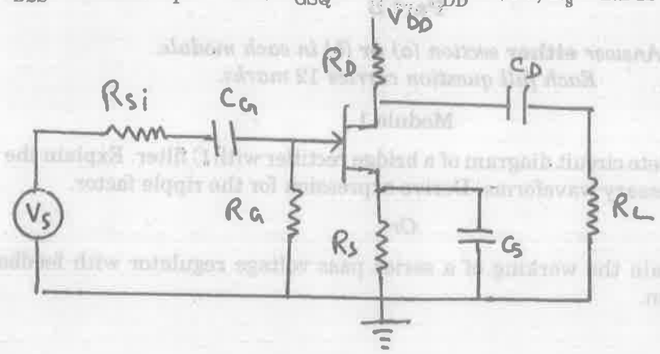
Module 4

14. (a) Sketch the circuit, diagram of RC coupled CE amplifier with potential divider bias and design it to have output voltage swing 10 V_{PP}, voltage gain 120.

Or

(b) For the following circuit, calculate the voltage gain, input resistance and output resistance :

C_G = 0.047 μF, C_D = 1 μF, C_S = 3.3 μF, R_G = 1 M, R_L = 2.7 K, R_D = 2.2 K, R_{Si} = 600 Ω, I_{DSS} = 15 mA, V_P = – 4 V, V_{GSQ} = – 2 V. V_{DD} = 30V, R_s = 2.2 K



(12 marks)

Module 5

15. (a) Draw the circuit diagram for a slicer to limit at + 6 volt and – 5 volt using (i) Zener diodes ; (ii) using ordinary diodes. Design the circuits.

Or

(b) Draw the circuit diagram of a collector coupled astable multivibrator whose collector waveform has sharp rise and fall edges. With the help of the collector and base waveform, describe the working of this circuit.

(12 marks)

[5 × 12 = 60 marks]

(ii) Obtain the Fourier transform of the aperiodic pulse shown in Fig. 9.

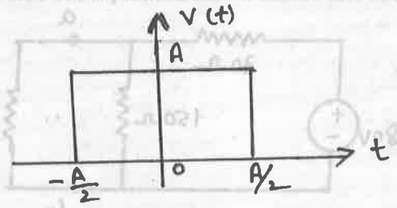


Fig-9

(6 marks)

Module 4

14. (a) (i) Find the z-parameters of the network in Fig. 10.

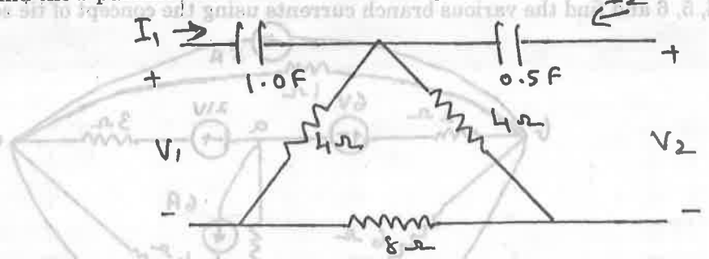


Fig-10

(6 marks)

(ii) Show that the mid frequency is the geometric mean between the lower and upper cut-off frequencies for a band-pass filter.

(6 marks)

Or

(b) Determine the Z, Y and transmission parameters of the network shown in Fig. 11.

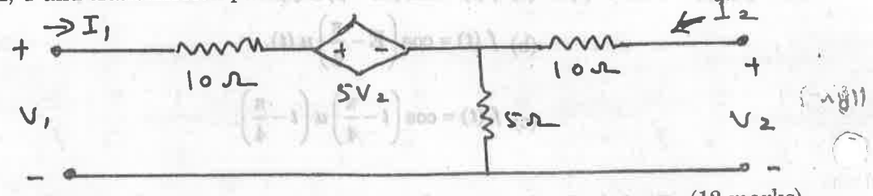


Fig-11

(12 marks)

Module 5

15. (a) Test whether the following functions are positive real ?

(i) $\frac{(2s+4)}{(s+5)}$; (ii) $\frac{s^2+2s+4}{(s+1)(s+3)}$; (iii) $\frac{\left(s^2+2s\right)}{(s+1)}$.

(3 × 4 = 12 marks)

Or

(b) Find the two Foster forms of the function :

$$Z(s) = \frac{\left(2s^3+8s\right)}{\left(s^2+1\right)}.$$

(12 marks)

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, MAY 2010

Third Semester

Branches : Electronics and Communication, Applied Electronics and Instrumentation, Electronics and Instrumentation

NETWORK THEORY (L A S)

(Prior to 2007 admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Give a general description of performing mesh analysis, what are the limitations of this method.
2. Write the transformed equivalents of inductance and capacitance considering initial conditions.
3. State and explain maximum power transfer theorem. Write the load impedance for maximum power transfer considering different constraints on load variation.
4. State and explain Thevenin's theorem. Illustrate with an example. How would you obtain the Norton equivalent from Thevenin equivalent ?
5. Find the Fourier Transform of $e^{-K(t)}$.
6. Why does the inductor act as an open circuit in transient conditions ? Explain.
7. A two-port network is terminated by a load impedance Z_L at port 2. Find the driving point impedance at port 1 in terms of :

   (i) z parameters and (ii) y parameters.
8. Compare constant K and m-derived filters.
9. Compare the properties of Foster and Cauer forms of networks.
10. Check whether $s^4 + 5s^3 + 4s^2 + 11s + 4$ is Hurwitz or not.

(10 × 4 = 40 marks)

Part B

Answer **either** *(a)* **or** *(b) of each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) (i) Calculate V_o in the circuit of Fig. 1 using the method of source transformation :

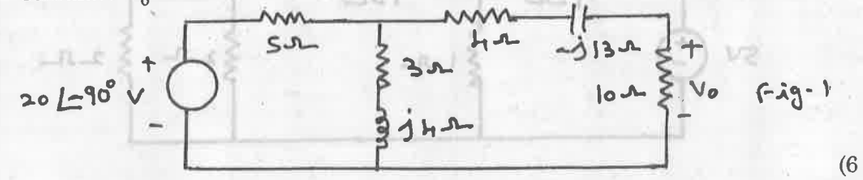


Fig-1

(6 marks)

(ii) In the coupled circuit of Fig. 2, find the input impedance and net inductance.

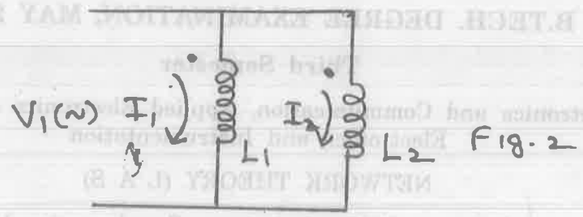


Fig. 2

(6 marks)

Or

(b) (i) Evaluate I using nodal analysis in the network shown in Fig. 3.

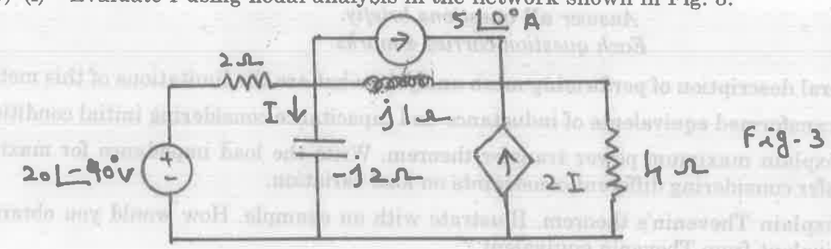


Fig. 3

(6 marks)

(ii) Calculate the power delivered by the dependent voltage source in the network shown in Fig. 4.

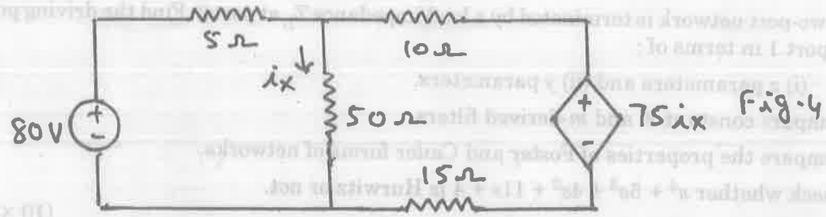


Fig. 4

(6 marks)

Module 2

12. (a) (i) Draw the graph of the network shown in Fig. 5. Select a tree and write base loop incidence matrix. Form loop equations and find loop currents and branch currents.

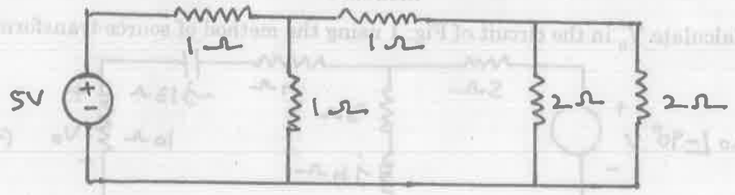


Fig. 5

(8 marks)

(ii) Find the load R_L that will result in maximum power delivered to the load for the circuit of Fig. 6.

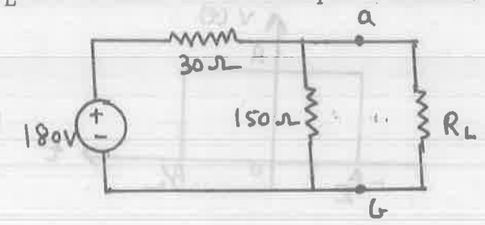


Fig. 6

(4 marks)

Or

(b) The ohmic values of resistnaces in Fig. 7 also represent the branch numbers. Form a tree with branches 4, 5, 6 and find the various branch currents using the concept of tie set and cut set matrices.

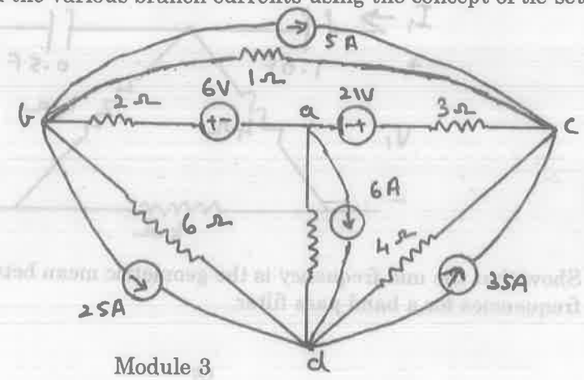


Fig. 7

(12 marks)

Module 3

13. (a) (i) Find F (*s*) if (a) $f(t) = \sin(\alpha t + \beta)\, u(t)$.

(b) $f(t) = \cos\left(E - \frac{\pi}{4}\right) u(t)$.

(c) $f(t) = \cos\left(t - \frac{\pi}{4}\right) u\left(t - \frac{\pi}{4}\right)$.

(3 × 2 = 6 marks)

(ii) Find the Laplace transform of a triangular wave of period T sec and amplitude A.

(6 marks)

Or

(b) (i) Determine the Laplace Transform of the waveform $f(t)$ in Fig. 8.

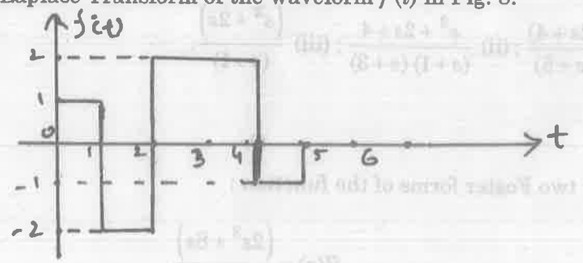


Fig. 8

(6 marks)

Turn over