F 2970 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branch—Common to all Branches

EN 010 302—ECONOMICS AND COMMUNICATION SKILLS

[AI, AN, AU, CE, CS, EC, EE, EI, IC, IT, ME, PE and PO]

(New Scheme—Regular/Improvement/ Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. What are the functions of stock markets ?
2. Mention any *six* MNC's working in India.
3. What do you mean by progressive and regressive taxes ?
4. What are the difficulties in estimating national income ?
5. What do you mean by BOP ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Explain the credit control system of RBI.
7. Comment on LPG (Liberalisation, Privatisation and Globalisation).
8. What are the major functions of taxation system ?
9. Explain the major causes of inflation in a country.
10. Comment on the impact of WTO decisions on Indian industries.

(5 × 5 = 25 marks)

Part C

Answer any one **full** *question.*
Each question carries 12 *marks.*

11. Explain the role of National banks for the agriculture and rural development.

Or

12. Banker's bank of India is RBI. Explain.

Turn over

13. Comment on the effects of MNC's in growth of India.

Or

14. The growth of IT industry is essential for India. Explain the reasons.

15. The major source of a nation is taxation system. Give reasons.

Or

16. Write notes on (a) Direct and indirect taxes ; (b) Tax evasion ; and (c) Deficit financing.

17. Explain the methods of estimating National Income.

Or

18. What are the measures of controlling inflations ? Explain.

19. Explain the causes of disequilibrium in India's Balance of payments (BOP).

Or

20. Comment on the effects TRIPS and TRIMS in the Indian economy.

(5 × 12 = 60 marks)

F 2988 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branch : Applied Electronics and Instrumentation / Electronics and Communication Engineering

AI 010 305 / EC 010 305 – ANALOG CIRCUITS – I (AI, EC)

(New Scheme – Regular / Improvement / Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Explain the need of short circuit protection.
2. What are the stability factors to be considered in transistor biasing.
3. Why are *n*-channel MOSFETs preferred over *p*-channel MOSFET.
4. Classify MOSFETs. Compare a MOSFET with JFET.
5. Describe stability criteria in a feedback circuit.

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. With diagram, explain the working of a shunt voltage regulator.
7. Derive different *h*-parameters of a general two-port network.
8. Give the V-I relationships of N-channel and *p*-channel MOSFETs.
9. What is Miller effect? Explain.
10. With diagram, explain the working of class-S power amplifier. Where is it mostly employed?

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. Explain the operation of the following with suitable diagrams :
    (i) positive and negative clippers.
    (ii) biased clamping circuits.

Or

Turn over

12. With circuit diagram, perform the analysis of a transistorized series feedback regulator.

13. Sketch block and circuit diagrams of a CE amplifier *h*-parameter equivalent circuit. Derive expressions of A_I, Z_I, Av and Yo in terms of *h*-parameters.

Or

14. Sketch hybrid-π model of CB amplifier. Derive relations of gain, input and output impedances.

15. Derive small signal model relations of A_v, A_I, Z_I and Z_0 of common source MOSFET amplifier with bypass capacitor.

Or

16. Sketch and explain the working of a common source MOSFET amplifier without bypass capacitor.

17. Sketch and analyse the high frequency response of CC BJT amplifier.

Or

18. With meat diagram, explain the construction, working and performance analysis of a CD MOSFET amplifier.

19. (a) Why non-linear distortion is called harmonic distortion.

    (b) Explain the operation of class-B power amplifier.

Or

20. (a) Design and analyse transconductance and transresistance amplifiers.

    (b) What is intermodulation distortion in power amplifiers?

(5 × 12 = 60 marks)

anium sample is uniformly doped with 5×10^{16} atoms per CC of Indium. Assume all impurity re ionized and take $n_i = 2 \times 10^{13}$ per CC at 290 K.

Calculate the electron and hole concentrations in the sample.

Assume that the intrinsic concentration in Germanium increases by 6 % per° K rise in temperature, estimate the temperature at which the sample becomes intrinsic.

Module 2

g from fundamentals, derive the continuity equation for electrons and holes in a conductor. What are its implications ?

Or

Explain transition capacitance and storage capacitance of a PN junction diode. (8 marks)

Calculate the contact potential of PN junction diode having $N_A = 8 \times 10^{16}$ per CC, $N_D = 2 \times 10^{13}$ per CC at 300 K., $n_i = 1.5 \times 10^{10}$ per CC.

(4 marks)

Module 3

Derive expression for the maximum electric field across an abrupt *p-n* junction.

What is meant by storage delay time ? How is it related to the (i) current through the diode ; (ii) life time of carrier ?

Or

silicon PN junction at 300 K has $N_A = 10^6$ per CC and $N_D = 10^{15}$ per CC $C_n = C_p = 0.1$ μS, $= 10^{-3}$ cm.^{2} Determine :

(a) Junction capacitance at zero bias C_{jo}.

(b) Junction capacitance at $V_a = -5$ V.

(c) Storage capacitance at $V_a = 0.5$ V.

(d) Can this be used as a varactor diode ? Why ?

Module 4

Draw and explain the labelled energy band diagrams of an *npn* transistor with uniform doping and under :

(i) Equilibrium. (ii) Forward active.

(iii) Saturation. (iv) Cut-off.

Or

8. Derive the expressions for α, β, γ and I_{CBO} of an *npn* transistor.

Module 5

9. With the help of neat energy band diagrams, explain the working of MOS transistor under :

(i) Equilibrium. (ii) Negative voltage is applied.

(iii) Positive voltage is applied. (iv) Large positive voltage applied.

Or

20. (a) Explain short channel effects in MOSFET.

(b) Calculate the maximum width of the depletion region for an ideal MOS capacitor on *p*-type silicon with $N_A = 10^{16}$ per CC, $n_i = 1.5 \times 10^{10}$ per CC and $\varepsilon_s = \varepsilon_o \ \varepsilon_r = 11.8 \times 8.85 \times 10^{-14}$.

(5 × 12 = 60 marks)

F 2978 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

AI 010 304/EC 010 304—SOLID STATE DEVICES (AI, EC)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. What is effective mass ?
2. What do you mean by contact potential ?
3. What is Zener breakdown ?
4. Define pinch off voltage and saturation voltage.
5. Differentiate the D-MOSFET with E-MOSFET.

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Differentiate between drift and diffusion currents.
7. Explain how unidirectional current flow is possible through a PN junction diode.
8. What is varactor diode ? What are its applications ?
9. Explain the basic principle of a phototransistor.
10. Why is Ge not used for making solar cells ?

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Explain the energy band in solids. Differentiate between direct and indirect semiconductors.

Or

12. Derive the expression for carrier concentration in a semiconductor and explain.
13. What is meant by direct and indirect recombination ?

Or

14. Derive the diffusion coefficients Einsteins relation.

Turn over

F 3027 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

SOLID STATE DEVICES (L A S)

(Supplementary/Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. With the help of E-K diagram, explain the direct and indirect band gap semiconductor.
2. A silicon sample is doped with 6×10^{16} arsenic atoms per CC and 3×10^{16} boron atoms per CC. Determine (i) electron and hole concentrations at 27° C. room temperature and (ii) the position of the Fermi level. Assume $n_i = 1.5 \times 10^{10}$ per CC at 27° C.
3. List the assumptions made in the derivation of the ideal diode current equation.
4. Clearly explain the avalanche breakdown mechanism.
5. Explain the operation of tunnel diode with the help of energy band diagram.
6. Plot the minority carrier distribution across an abrupt *p-n* junction under (i) forward bias ; (ii) reverse bias.
7. Define injection efficiency and transport factor of a BJT. How they are related to α and β ?
8. What are the factors which determine the turn-off time of a transistor switch ?
9. Explain how JFET can be used as a variable resistor.
10. Explain clearly the pinch off and saturation voltage of a JFET.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Explain the process of carrier drift and diffusion. Derive expressions for diffusion current density and drift current density in a semiconductor.

Or

Turn over

12. A Germanium sample is uniformly doped with 5×10^{16} atoms per CC of Indium. Assume all impurity atoms are ionized and take $n_i = 2 \times 10^{13}$ per CC at 290 K.

    (a) Calculate the electron and hole concentrations in the sample.

    (b) Assume that the intrinsic concentration in Germanium increases by 6 % per° K rise in temperature, estimate the temperature at which the sample becomes intrinsic.

Module 2

13. Starting from fundamentals, derive the continuity equation for electrons and holes in a semiconductor. What are its implications ?

Or

14. (a) Explain transition capacitance and storage capacitance of a PN junction diode. (8 marks)

    (b) Calculate the contact potential of PN junction diode having $N_A = 8 \times 10^{16}$ per CC, $N_D = 2 \times 10^{13}$ per CC at 300 K., $n_i = 1.5 \times 10^{10}$ per CC.

(4 marks)

Module 3

15. (a) Derive expression for the maximum electric field across an abrupt *p-n* junction.

    (b) What is meant by storage delay time ? How is it related to the (i) current through the diode ; (ii) life time of carrier ?

Or

16. A silicon PN junction at 300 K has $N_A = 10^6$ per CC and $N_D = 10^{15}$ per CC $C_n = C_p = 0.1$ μS, $A = 10^{-3}$ cm.^{2} Determine :

    (a) Junction capacitance at zero bias C_{jo}.

    (b) Junction capacitance at $V_a = -5$ V.

    (c) Storage capacitance at $V_a = 0.5$ V.

    (d) Can this be used as a varactor diode ? Why ?

Module 4

17. Draw and explain the labelled energy band diagrams of an *npn* transistor with uniform doping and under :

    (i) Equilibrium. (ii) Forward active.

    (iii) Saturation. (iv) Cut-off.

Or

18. Derive the expressions for α, β, γ and I_{CBO} of an *npn* transistor.

Module 5

19. With the help of neat energy band diagrams, explain the working of MOS transistor under :

    (i) Equilibrium. (ii) Negative voltage is applied.

    (iii) Positive voltage is applied. (iv) Large positive voltage applied.

Or

20. (a) Explain short channel effects in MOSFET.

    (b) Calculate the maximum width of the depletion region for an ideal MOS capacitor on *p*-type silicon with $N_A = 10^{16}$ per CC, $n_i = 1.5 \times 10^{10}$ per CC and $\varepsilon_s = \varepsilon_0 \ \varepsilon_r = 11.8 \times 8.85 \times 10^{-14}$.

($5 \times 12 = 60$ marks)

15. Explain the operation and characteristics of LED. Which are the materials used for fabrication ?

Or

16. Explain in detail the V-I characteristics of Zener diode. Explain any one application of Zener diode.

17. Calculate emitter injection efficiency and base transport factor for BJT.

Or

18. Derive an expression for equilibrium conductance (Go) of the channel of JFET.

19. Explain the principle of operation of tunnel diode with a neat sketch and energy band diagrams. Mention the advantages and applications of tunnel diode.

Or

20. Draw the physical structure of SCR. Discuss the doping of various junctions. Draw the characteristics and explain any one typical application.

(5 × 12 = 60 marks)

F 2997 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branch : Applied Electronics and Instrumentation/Electronics and Communication/ Electronics and Instrumentation/Instrumentation and Control Engineering

AI 010 306
EC 010 306
EI 010 306
IC 010 306
} COMPUTER PROGRAMMING (AI, EC, EI And IC)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. What is an algorithm ?
2. Define function in C.
3. What is a Union ?
4. What are the uses of pionters ?
5. What are macros ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Explain interactive programming.
7. Explain with an example the usage of SWITCH statement.
8. Explain with examples the user defined data types.
9. Explain with examples the operations on pointers.
10. Explain and give examples for command line parameters.

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. Write an algorithm to find the prime numbers between 100 and 1000. Draw the corresponding flowchart also.

Or

Turn over

12. Explain with examples the data types used in C.

13. Write a program to evaluate the function

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

to 0.0001 % accuracy.

Or

14. Write a program to arrange given 100 names in alphabetic order.

15. Explain with a suitbale example the method of sending an entire structure as a parameter to a function.

Or

16. Write a program to add given number of days to a given data. Make use of structures wherever possible.

17. Explain with suitable examples, how pointers are used as function arguments.

Or

18. Write a program using pointers to read in an array of integers and print its elements in reverse order.

19. Write a program to compare two files and returns '0' if they are equal and '1' if they are not.

Or

20. Discuss on the different categories of C pre-processor.

(5 × 12 = 60 marks)

F 3043 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

COMPUTER PROGRAMMING (L, A, S)

(Supplementary/Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C program wherever necessary.

Part A

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

1. List the rules for forming variable names. Give examples.
2. Differentiate between scanf() and gets() with reference to string input. Give examples.
3. When do you use a comma operator ? Explain with examples.
4. Distinguish between :
   (a) Local variables and global variables.
   (b) Arguments and parameters in a function.
5. How do you declare an array ? Also explain initialisation of arrays ?
6. What is self referential structure ? Give an appropriate example.
7. Distinguish between Address operator and Dereferencing operator of a pointer.
8. Can you use the name of an array at a pointer ? Justify your answer.
9. What are the functions of preprocessor and preprocessor directives ?
10. Distinguish between macro and a variable name.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) What is a symbolic constant ? How they are declared ? Explain with examples. (4 marks)
    (b) What is a conditional operator ? When do you need this ? Explain with an example. (4 marks)

Turn over

(c) Locate the errors, if any, in the following statements. If there is an error, correct it :—

(i) Scanf ("%C" & alph) ;

(ii) Printf ("d, %f", & x, y) ;

(iii) Printf (WELCOME TO C) ;

(iv) Scanf ("%f", & num & x).

(4 × 1 = 4 marks)

Or

12. List all types of operators in C and give the precedence and associativity between them.

Module 2

13. Write a C program to simulate a calculator to perform arithmetic operations like addition, subtraction, multiplication and division only on integers. Error message should be reported if any attempt is made to divide by zero.

Or

14. Write a C program that accepts a one-dimensional array of integers and sort them in an ascending order, using a parameter passing mechanism.

Module 3

15. Write a C Program to accept a message for telegram and compute the bill. If there are less than 10 words then each word is charged Rs. 0.80 and if there are more than 20 words then the charge will be Rs.10 and Rs. 0.60 for each extra word exceeding 20.

Or

16. Write a C program to accept a line of text and display the number of digits and alphabets in it.

Module 4

17. Write a C program to accept two alphabets and pass them to the function via pointers which checks for the type of these alphabets. If both the alphabets are vowels, then the function should return to the calling function, their previous alphabets. If both the alphabets are consonants then the function should return their successive alphabets.

Or

18. Write a C program to find the desired element in an array of N elements. Use pointers for searching the element.

Module 5

19. Write a C program to create a data file to store a paragraph of your choice in a file named "input.txt" and read the contents form this file from its end and put into a new file named "output.txt".

Or

20. Write a C program to read a file and replace all spaces by hyphen (-). Finally show the contents of the updated file.

(5 × 12 = 60 marks)

F 3004 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branches : Civil/Mechanical/Electrical and Electronics/Polymer/Electronics and Communication/Applied Electronics and Instrumentation/Instrumentation and Control/ Electronics and Instrumentation/Automobile Engineering/Aeronautical Engineering

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(Supplementary/Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

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

Module 1

1. (a) If $\vec{r} = a\cos t\,\hat{i} + a\sin t\,\hat{j} + at\tan\alpha\,\hat{k}$, find $\left|\frac{d\vec{r}}{dt}\times\frac{d^2\vec{r}}{dt^2}\right|$ and $\left|\frac{d\vec{r}}{dt}\,\frac{d^2\vec{r}}{dt^2}\,\frac{d^3\vec{r}}{dt^3}\right|$.

(b) A particle moves on the curve $x = 2t^2, y = t^2 - 4t, z = 3t - 5$ where t is the time. Find the components of velocity and acceleration at time $t = 1$ in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$.

Or

(c) Find the divergence and curl of the vector $\vec{R} = (x^2 + yz)\hat{i} + (y^2 + zx)\hat{j} + (z^2 + xy)\hat{k}$.

(d) Find the directional derivative of $\nabla\cdot(\nabla\phi)$ at the point (1, –2, 1) in the direction of the normal to the surface $xy^2z = 3x + z^2$, where $\phi = 2x^3y^2z^4$.

Module 2

2. (a) If $\vec{F} = (2x^2 - 3z)\hat{i} - 2xy\,\hat{j} - 4x\,\hat{k}$, then evaluate $\iiint_V \nabla\times\vec{F}\,dV$ where V is the closed region bounded by the planes $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$.

(b) Verify Stoke's theorem for the vector field $\vec{F} = (x^2 - y^2)\hat{i} + 2xy\,\hat{j}$ integrated round the rectangle in the plane $z = 0$ and bounded by the lines $x = 0, y = 0, x = a, y = b$.

Or

Turn over

(c) Evaluate $\iint_S (\nabla \times \vec{A}) \cdot \hat{n}\, dS$, where S is the surface of the cone $z = 2 - \sqrt{x^2 + y^2}$ above the xy–plane and $\vec{A} = (x - z)\,\hat{i} + (x^3 + yz)\,\hat{j} - 3xy^2\,\hat{k}$.

(d) Verify divergence theorem for $\vec{F} = 2x^2 y\,\hat{i} - y^2\,\hat{j} + 4xz^2\,\hat{k}$ taken over the region in the first octant bounded by $y^2 + z^2 = 9$ and $x = 2$.

Module 3

3. (a) Determine the analytic function whose real part is $e^{-x}(x \sin y - y \cos y)$.

(b) If $f(z)$ is an analytic function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log |f'(z)| = 0$.

(c) Find the image of the circle $|z| = 2$ under the transformation $W = z + 3 + 2i$.

Or

(d) Show that the function $u = e^{-2xy} \sin(x^2 - y^2)$ is harmonic. Find the conjugate function V and express $u + iV$ as an analytic function of z.

(e) Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $|z| < 1$.

Module 4

4. (a) Prove that $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$ interval of differencing is unity.

(b) Evaluate $\left(\frac{\Delta}{E}\right)^2 f(x)$, where h is the interval of differencing.

(c) Use Lagrange's interpolation formula and find the value at $x = 3.5$ with the following data for y :

x :	1	3	5
y :	1.5708	1.5716	1.5736

Or

(d) Prove that $e^x = \left[\frac{\Delta^2}{E}\right] e^x \cdot \frac{E e^x}{\Delta^2 e^x}$, the interval of differencing being unity.

(e) The following table gives the population of a town during the last six censuses. Estimate, using Newton's interpolation formula, the increase in the population during the period from 1996 to 1998.

Year	:	1901	1911	1921	1931	1941	1951
Population (in thousands)	:	22	25	30	40	59	72

Module 5

5. (a) Given the following tabulated values of a function :

x :	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0520

Prepare a difference table and evaluate y' at $x = 1.2$.

(b) Certain values of x and y are given below :

x :	0	0.25	0.50	0.75	1.0
y :	1	0.9394	0.7788	0.5694	0.3678

Estimate the value of the integral $\int_0^1 y\, dx$, using both the Trapezoidal and Simpson's rule.

Or

(c) Solve the following difference equation :

$y_{n+2} - y_{n+1} + y_n = 0$, given that $y_0 = 1$ and $y_1 = \frac{1 + \sqrt{3}}{2}$.

(d)

x :	0.0	0.1	0.2	0.3	0.4	0.5	0.6
y :	3.013	3.162	3.287	3.364	3.395	3.381	3.324

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 0.3$.

(5 × 20 = 100 marks)

F 2968 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branch : Common to all Branches except CS and IT

EN 010 301-A—ENGINEERING MATHEMATICS—II

(CE, ME EE, AU, AN, EC, AI, EI, IC, PE AND PO)

[New Scheme—Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Evaluate grad $\left(\frac{1}{r}\right)$ where $r = |\bar{r}|$ and $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$.

2. If R is a region bounded by a simple closed curve C, then using Greens theorem show that the area of R is given by $\frac{1}{2}\oint_c [xdy - ydx]$.

3. Prove that $\Delta \log f(x) = \log\{1 + \Delta f(x)\}$.

4. What is numerical differentiation ? Explain.

5. Find $Z\{\sin(3n+5)\}$.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. If $\bar{f} = xyz\bar{i} + 3x^2y\bar{j} + (xz^2 - y^2z)\bar{k}$ find div $\bar{f}$ and curl $\bar{f}$ at (1, 2, 3).

7. If $\bar{F} = (3x^2 + 6y)\bar{i} - 14yz\bar{j} + 20xz^2\bar{k}$ evaluate $\int_C \bar{F} \cdot d\bar{r}$ from (0, 0, 0) to (1, 1, 1) along the path $x = t, y = t^2$ and $z = t^3$.

8. Prove that : (a) $E^{1/2} - \frac{1}{2}f - \mu = 0$ and (b) $\Delta = \frac{1}{2}f^2 + f\sqrt{1 + \frac{f^2}{4}}$.

Turn over

9. Solve $y_{x+2} - 4yx = 9x^2$.

10. Prove that $Z\left\{\frac{1}{n}\right\} = z \log \frac{z}{z-1}$.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module I

11. (a) Find the directional derivative of $\phi(x,y,z) = 4xz^3 - 3x^2yz^2$ at (2, –1, 2) along the z-axis.

(5 marks)

(b) Prove that $\operatorname{div}\{\bar{f} \times \bar{g}\} = \bar{g} \cdot (\operatorname{curl} \bar{f}) - \bar{f} \cdot (\operatorname{curl} \bar{g})$. (7 marks)

Or

12. (a) Prove that $\bar{f} = (2x + yz)\bar{i} + (4y + zx)\bar{j} - (6z - xy)\bar{k}$ is both solenoidal and irrotational. Also find the scalar potential of $\bar{f}$.

(7 marks)

(b) Prove that $\nabla^2\left\{\nabla \cdot \left(\frac{\bar{r}}{r^2}\right)\right\} = 2r^{-4}$. (5 marks)

Module II

13. Verify Stoke's theorem for $\bar{F} = y\bar{i} + z\bar{j} + x\bar{k}$, where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ and C its boundary.

(12 marks)

Or

14. Verify divergence theorem for $\bar{F} = 4xz\bar{i} - y^2\bar{j} + yz\bar{k}$ and S is the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0$ and $z = 1$.

(12 marks)

Module III

15. Find y_{32} given y_{20} = 14.035, y_{25} = 13.674, y_{30} = 13.257, y_{35} = 12.734, y_{40} = 12.089 and y_{45} = 11.309.

(12 marks)

Or

16. Using Lagrange's interpolation formula obtain the polynomial from the following data :

x	:	0	1	3	4
y	:	–12	2	6	12

Hence determine y when x = 2 and x = 5.

(12 marks)

Module IV

17. From the following data find dy/dx and d^2y/dx^2 at x = 1.5.

x	:	1.0	1.1	1.2	1.3	1.4
y	:	43.1	47.7	52.1	56.4	60.8

(12 marks)

Or

18. Determine the value of $\int_0^1 e^{-x^2} dx$ correct to four places of decimals using Simpson's rule with h = 0.1.

(12 marks)

Module V

19. Using the inversion integral method find the inverse z transform of :

$$\frac{z(2z-1)}{2(z-1)\left(z+\frac{1}{2}\right)}.$$

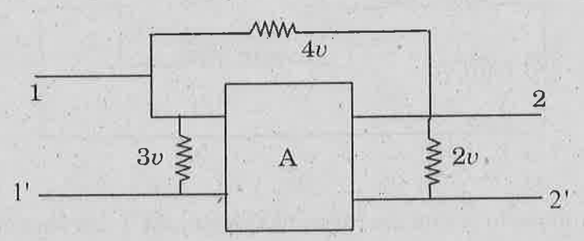
(12 marks)

Or

20. Using z-transform solve $u_{n+2} - 2u_{n+1} + u_n = 3_{n+5}$. (12 marks)

[5 × 12 = 60 marks]

19. The box in figure contain a resistance network having the Y parameters $Y_{11} = 6v$, Y_{12}, $= -2v$, $Y_{21} = -2v$ and $Y_{22} = 5v$. The circuit is modified by adding three new admittances. Find the Y parameters of the new circuit.



Or

20. Draw the Bode plots of the system given by $G(s) = \dfrac{10(1+s)}{s^2(s^2+4s+16)}$.

(5 × 12 = 60 marks)

F 2971 (Pages : 4) **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branch—Electronics and Communication/Electronics and Instrumentation/Applied Electronics and Instrumentation/Instrumentation and Control Engineering

EC 010 303 / EI 010 303 / AI 010 303 / IC 010 303—NETWORK THEORY (EC, EI, AI, IC)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

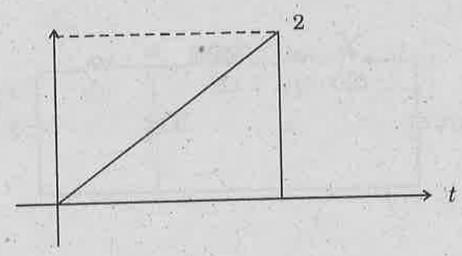
1. State Kirchhoff's Laws.
2. What is meant by order of a circuit ? What is its significance ?
3. What is the dot convention of coupled circuit ?
4. Obtain the Laplace transform of a pulse with width T and magnitude I.
5. What are transmission parameters ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. What is the Thevenin equivalent of a circuit ? Explain.
7. Obtain the equation for charging of a capacitor in RC network connected to a d.c. voltage of V volts.
8. Define the terms amplitude, frequency, phase difference, period, and phase sequence of a sine wave.
9. Obtain the Laplace Transform of the wave form shown in figure.



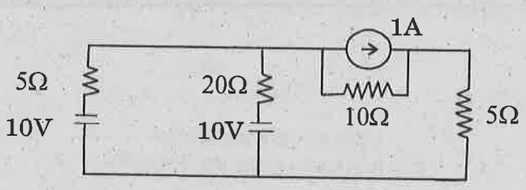
10. Obtain the relation between Y and h parameters.

(5 × 5 = 25 marks)

Part C

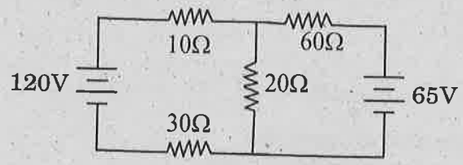
Answer any **one** *question.*
Each question carries 12 *marks.*

11. Find the current through the 5Ω resistance :



Or

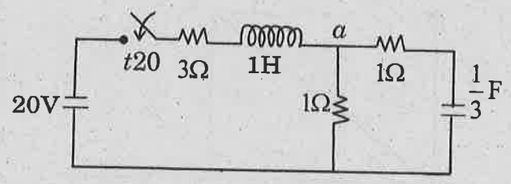
12. Use Thevenin's theorem to find the current through 20Ω resistor



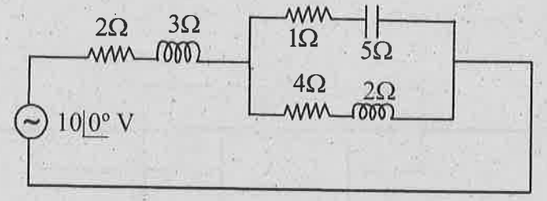
13. A 50, μF capacitor and 20,000 Ω resistor are connected in series across a 100 V battery at $t = 0$. At $t = 0.5$s the battery voltage is suddenly increased to 150 V. Find the charge on the capacitor at $t = 0.75$ s.

Or

14. In the circuit shown, the switch is closed at $t = 0$. Assuming that the circuit was initially dead, find the expression for the current supplied by the battery and voltage of node a.

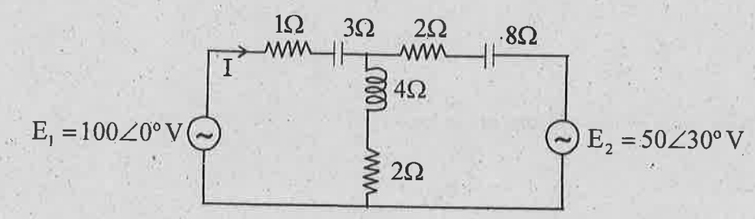


15. For the circuit shown find (i) total impedance ; (ii) current drawn from supply ; (iii) current in each branch ; (iv) power ; and (v) power factor.

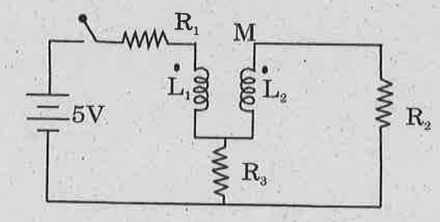


Or

16. Use superposition theorem to find the current I through the $1 - j3$ ohm impedance.



17. Find the value of the transient current in R_2 when the switch is closed. Assume zero initial current $R_1 = R_2 = 2\Omega$, $R_3 = 1\Omega$, $L_1 = 0.1$ H, $L_2 = 0.2$ H M = 0.1 H.



Or

18. (a) $I(s) = \dfrac{s^2 + 7s + 12}{s^2 + 3s + 2}$, find $i(t)$.

(b) If $I(s) = 5\left[\dfrac{s + 250}{s(s + 100)}\right]$ find initial and final values of $i(t)$.

16. Find $v(t)$ for $t < 0$ and $t > 0$ in the circuit in Fig. 9.

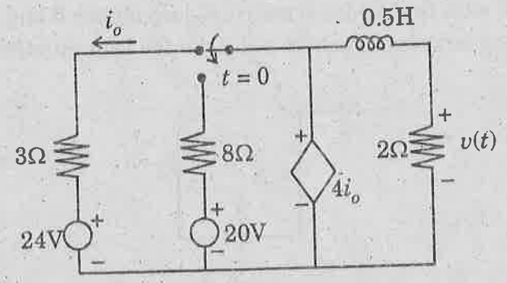


Fig. 9.

MODULE 4

17. A network has transmission matrix :

$\begin{bmatrix} (1+j) & 2000 \\ j0.001 & 1 \end{bmatrix}$. Determine the parameters for two such networks in cascade.

Or

18. Design a T and π constant K high pass filter having cut-off frequency of 12 kHz and nominal impedance $R_0 = 500\ \Omega$ and draw the circuits. Also find (i) its characteristic impedance and phase constant at 24 kHz and (ii) attenuation at 4 kHz.

MODULE 5

19. (a) Check whether the following are Hurwitz or not

(i) $P(s) = s^5 + s^3 + 2s^2 + 3s + 1.$

(ii) $P(s) = s^6 + 25^5 + 14s^4 + 26s^3 + 49s^2 + 72s + 36.$

(b) Check whether $\dfrac{s^2 + s + 1}{s^2 + s + 4}$, is positive real or not.

Or

20. Given $F(s) = \dfrac{7(s+2)(s+4)}{s(s+3)}$, find the continued fraction expansion and hence synthesize the network for the case when :

(a) F (s) is an impedance Z (s).

(b) F (s) is an admittance Y (s).

(5 × 12 = 60 marks)

F 3009

(Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

NETWORK THEORY (L A S)

(Supplementary / Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the dot rule and coupled circuits.
2. Two coupled coils with self inductance $L_1 = 0.6$ H and $L_2 = 0.2$ H have a coupling coefficient of 0.65. If the current in the first coil is $i_1 = 8 \sin 200\,t$ Ampere, determine the voltage in the second coil.
3. For the circuit shown in Fig. 1 below, determine V_1, V_2, V_3 and I.

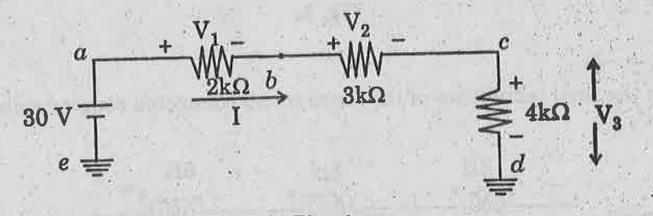


Fig. 1.

4. What is Tellegen's theorem ? Explain its applications.
5. State and prove final value theorem. Indicate when it fails ?
6. Using gate function, obtain the Laplace Transform of one cycle of $f(t) = \cos(t)$.
7. Find the Transfer functions of the following network in Fig. 2.

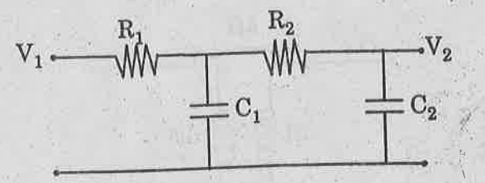


Fig. 2.

8. Find Z_0 for a π-network terminated with Z_0 in terms of prototype impedances.
9. What is natural frequency of a network ? What is the physical significance of it ? Comment on the pole zero plot of a positive real function.
10. List the properties of Hurwitz polynomial.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 marks.

MODULE 1

11. Find I_3/I_s for the circuit in Fig. 3, using mesh analysis.

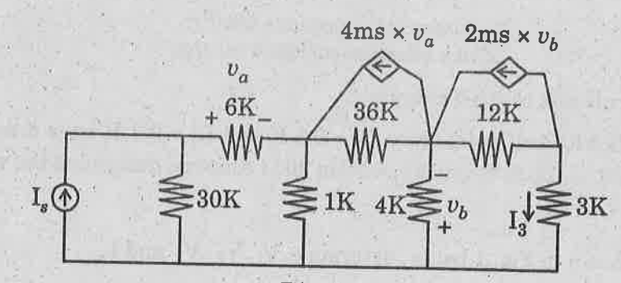


Fig. 3.

Or

12. (a) Calculate the total inductance of the three series connected coupled coils shown in Fig. 4.

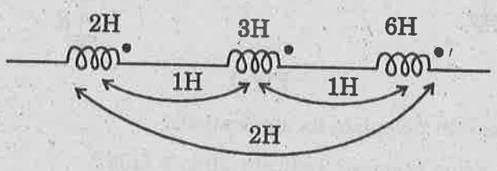


Fig. 4.

(b) Calculate the equivalent (i) T-network (ii) π-network parameters of the linear transformer shown in Fig. 5.

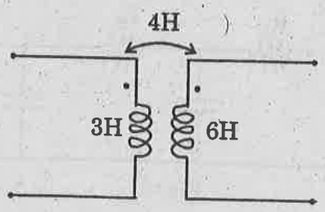


Fig. 5

MODULE 2

13. For the graph of Fig. 6, with the incidence matrix A, loop matrix B and branch impedance matrix. Then determine the loop impedance matrix and write the loop equation in matrix form.

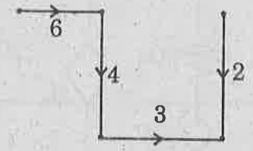


Fig. 6.

Or

14. In the circuit shown in Fig. 7, determine the impedance of the loudspeaker so that the power absorbed by it is maximum and also calculate the power absorbed. If the loudspeaker is having 10 Ω internal resistance, then calculate the current through it.

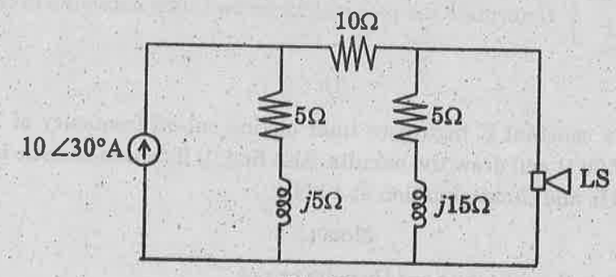
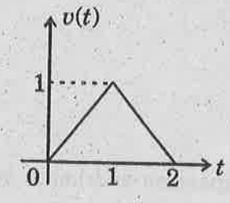


Fig. 7

MODULE 3

15. A triangular wave as shown in Fig. 8 is applied as input, to a series RL circuit. Calculate the current $i(t)$ in the circuit, using Laplace Transform.



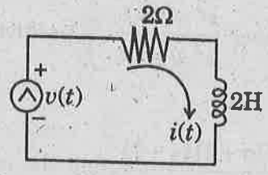


Fig. 8

Or

F 3018 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

ELECTRICAL TECHNOLOGY (L A S)

(Supplementary/Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the concept of armature reaction in DC machine.
2. A shunt generator has a full-load current of 196 A at 220 V. The stray losses are 680 W and the shunt field coil resistance is 50 Ω. If it has a full-load efficiency of 90 %, find the armature resistance. Also find the load current corresponding to maximum-efficiency.
3. Draw and explain the characteristics of DC series motor.
4. Derive the torque equation of DC motor.
5. Mention the differences between a single-phase and 3-phase transformer constructions.
6. Why is short circuit test performed on HV side ?
7. Why is it not possible for the rotor speed of an induction motor to be equal to the speed of its rotating magnetic field ?
8. Mention the starting methods of synchronous motor. Explain any one of them.
9. How stepper motors are classified ? What are their applications ?
10. Explain the working of a servomotor ? What are its applications ?

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) With neat diagram, explain the open circuit characteristics of a DC generator.

    (b) A 100 kW, 220 V, DC shunt generator has a field resistance of 50 Ω and armature resistance of 0.062 Ω. Calculate the full-load generated e.m.f.

Or

12. (a) What is commutation in DC generator ? Explain methods of improving commutation.

(b) Determine the back and front pitches for a 6 pole wave winding with 64 slots and 256 commutator segments wound with single turn coils. If the flux per pole is 0.05 Wb, determine the induced e.m.f. in the winding for a speed of 1000 r.p.m. in the d.c. generator.

Module 2

13. (a) With a neat diagram, explain the working of a 3-point starter.

(b) A 220 V, 4 pole, d.c. series motor has a wave connected winding with 35 slots and 12 conductors per slot on its armature. Its flux per pole is 0.02 Wb and the motor takes 50 A on full-load. Its total resistance is 0.3 Ω. Calculate the torque it develops and the speed at which it runs on full-load. If its friction and windage losses are 750 W, find its efficiency.

Or

14. (a) With a neat circuit diagram, explain Swinburne's test conducted on a d.c. machine.

(b) A 6 pole lap wound shunt motor has 500 conductors. The armature and shunt field resistances are 0.05 Ω and 25 Ω respectively. Find the speed of the motor, if it takes 120 A from a d.c. supply of 100 volts. Take flux per pole as 20 milliwebers.

Module 3

15. (a) Stating all assumptions, explain the phasor diagram of a single-phase transformer with load.

(b) A single-phase, 50 Hz transformer has square core of 20 cm. side, the permissible maximum flux density in the core is 1 Wb/m.^{2} Calculate the number of turns per limb on the high and low voltage sides for a 3000/220 volts ratio. To allow for insulations assume the net iron length to be 90 % of the gross iron length.

Or

16. (a) Derive the expression for saving of copper in an autotransformer.

(b) In a 50 kVA transformer, the iron loss is 500 Watts and the full-load copper loss is 750 watts. Find the efficiency at full-load and half full-load at 0.8 p.f. lagging.

Module 4

17. (a) With neat circuit diagram, explain e.m.f. method of finding out regulation of an alternator.

(b) Two alternators working in parallel, supply a lighting load of 3 MW and motor load of 5 MW at a p.f. 0.7 lagging. One machine is loaded upto 5 MW at 0.8 p.f. lagging. What is the load and p.f. of the other machine ?

Or

18. (a) Give the power flow diagram of a 3-phase induction motor. Explain the losses in the machine.

(b) A 3-phase, 440 V, 50 Hz induction motor with star connected stator winding gave the following results on blocked rotor test :

Line voltage : 33.3 V

Line current : 66 A

Watt meter readings : 2150 and 765 W

Stator resistance per phase 0.1 Ω

Calculate the maximum torque and the slip at which it occurs.

Module 5

19. With a neat constructional diagram, explain the working of a tachogenerator. Discuss its application.

Or

20. Explain the diagram, indicating the parts of an electromagnetic relay. Describe its working clearly.

(5 × 12 = 60 marks)

Module 5

19 With a neat circuit and waveforms, explain the working of an emitter coupled astable multivibrator ? Compare and contrast it with the collector coupled type.

Or

20. Draw and design a two-level clipping circuit to limit at + 8V and – 6V :

(a) Using silicon diodes and voltage sources.

(b) Using Zener diodes with minimum member of components.

(5 × 12 = 60 marks)

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Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

ELECTRONIC CIRCUITS—I (L A S)

(Supplementary/Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What parameter is accepted as the figure- of- merit of a rectifier ? Give its significance.
2. Draw a current limiting circuit using BJT and explain its control action.
3. With the help of a neat characteristic graph, explain how h_{re} is determined ?
4. What is pinch-off ? With a neat diagram, show what happens to the channel during pinch-off ?
5. In the circuit of Figure 1, the n-p-n silicon transistor has V_{BE} = 0. 7 Volt and V_{CE} = 6 volt when $R_C = 4k\Omega$ and $\beta = 50$. Calculate I_C and R_B

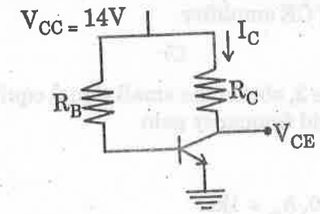

Figure. 1

Figure 1

6. Describe the merits and demerits of the collector-to base bias circuit.
7. Calculate the value of emitter bypass capacitor to provide a low frequency 3 dB point of 100 Hz for a CE BJT amplifier. Given : R_E = 1.5 kΩ, β = 100, r_π = 1kΩ, R_S = 1 kΩ, R_B = 1MΩ.
8. Draw the circuit diagram of a two-stage RC coupled CE amplifier ?
9. What is meant by negative resistance ? Explain clearly how it occurs, with the help of an example.
10. Draw the circuit of an RC integrator and derive the condition for good integration.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 marks.

Module 1

11. A full wave diode rectifier supplies a load of 10 kΩ. The a.c. voltage applied to the diode is 230-0-230 V r.m.s. If the diode resistance is neglected, calculate (i) V_{dc} ; I_{dc} ; (iii) I_{rms} ; (iv) form factor ; and (v) ripple voltage ; (vi) Draw the circuit diagram.

Or

12. (a) With necessary waveforms, explain the filtering process using C filter. Derive expression for its ripple factor.

(b) Draw the circuit diagram of a ± 15 V dual power supply, regulated by IC ?

Module 2

13. A transistor in CB configuration is driven by a voltage source V_s of internal resistance $R_s = 600\Omega$. The load impedance is $R_L = 4k\Omega$. The $h_{ib} = 22\Omega$, $h_{rb} = 3 \times 10^{-4}$, $h_{fb} = -0.98$ $h_{ob} = 0.5\ \mu s$. For this amplifier, calculate the current gain A_I, input resistance R_i, voltage gain A_V, overall voltage gain A_{VS}, overall current gain A_{is} output resistance R_0 and power gain Ap.

Or

14. (a) With neat diagrams, describe the basic structure of an *n*-channel JFET. Indicate the biasing arrangement.

(b) Draw and explain small signal equivalent circuit model for JFET at low frequencies.

Module 3

15. Distinguish between d.c. load line and a.c. load line on collector output characteristic curves. Explain the procedure for locating the operating point suitably on the collector output characteristics of a potential divider bias circuit of CE amplifier.

Or

16. For the circuit shown in Figure 2, obtain the small signal equivalent circuit and calculate the load resistance R_L required for a mid frequency gain

$\left|\frac{V_0}{V_s}\right| = 50$. Take $\beta = 100$, $h_{ie} = 1k\Omega$

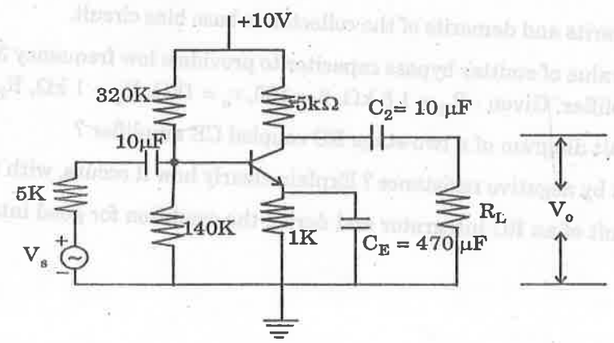

Figure 2

Module 4

17 For the circuit shown in Figure 3, obtain the low frequency small signal equivalent circuit and determine

(i) The lower half power frequency due to (a) C_{C_1} (b) CE.

(ii) Hence, determine the overall lower cut-off frequency of the circuit

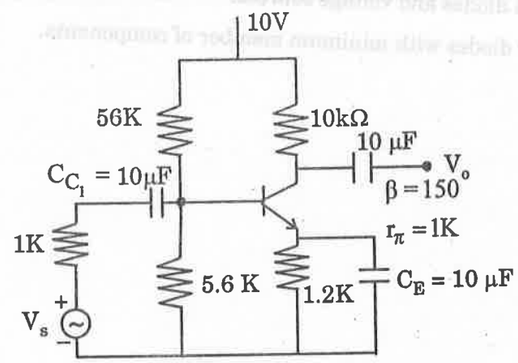

Figure 3

Or

18. For the circuit shown in Figure 4, determine :

(a) The mid band voltage gain.

(b) The upper 3dB corner frequency f_H

(Given r_d = 10K, g_m = 2.2 mS , C_{gd} = 5PF, C_{gs} = 4PF, C_{ds} = 1PF)

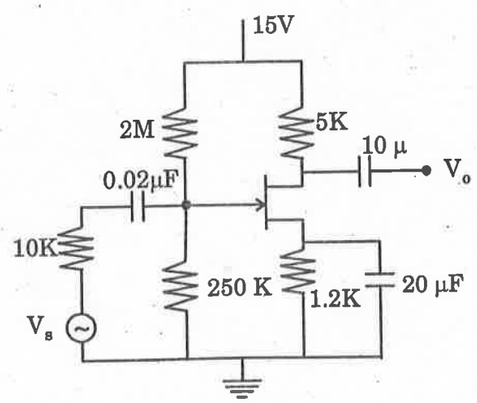

Figure 4

F 3027 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

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

SOLID STATE DEVICES (L A S)

(Supplementary/Mercy Chance—Old Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. With the help of E-K diagram, explain the direct and indirect band gap semiconductor.
2. A silicon sample is doped with 6×10^{16} arsenic atoms per CC and 3×10^{16} boron atoms per CC. Determine (i) electron and hole concentrations at 27° C. room temperature and (ii) the position of the Fermi level. Assume $n_i = 1.5 \times 10^{10}$ per CC at 27° C.
3. List the assumptions made in the derivation of the ideal diode current equation.
4. Clearly explain the avalanche breakdown mechanism.
5. Explain the operation of tunnel diode with the help of energy band diagram.
6. Plot the minority carrier distribution across an abrupt *p-n* junction under (i) forward bias ; (ii) reverse bias.
7. Define injection efficiency and transport factor of a BJT. How they are related to α and β ?
8. What are the factors which determine the turn-off time of a transistor switch ?
9. Explain how JFET can be used as a variable resistor.
10. Explain clearly the pinch off and saturation voltage of a JFET.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Explain the process of carrier drift and diffusion. Derive expressions for diffusion current density and drift current density in a semiconductor.

Or

Turn over

12. A Germanium sample is uniformly doped with 5×10^{16} atoms per CC of Indium. Assume all impurity atoms are ionized and take $n_i = 2 \times 10^{13}$ per CC at 290 K.

    (a) Calculate the electron and hole concentrations in the sample.

    (b) Assume that the intrinsic concentration in Germanium increases by 6 % per° K rise in temperature, estimate the temperature at which the sample becomes intrinsic.

Module 2

13. Starting from fundamentals, derive the continuity equation for electrons and holes in a semiconductor. What are its implications ?

Or

14. (a) Explain transition capacitance and storage capacitance of a PN junction diode. (8 marks)

    (b) Calculate the contact potential of PN junction diode having $N_A = 8 \times 10^{16}$ per CC, $N_D = 2 \times 10^{13}$ per CC at 300 K., $n_i = 1.5 \times 10^{10}$ per CC.

(4 marks)

Module 3

15. (a) Derive expression for the maximum electric field across an abrupt *p-n* junction.

    (b) What is meant by storage delay time ? How is it related to the (i) current through the diode ; (ii) life time of carrier ?

Or

16. A silicon PN junction at 300 K has $N_A = 10^6$ per CC and $N_D = 10^{15}$ per CC $C_n = C_p = 0.1$ μS, $A = 10^{-3}$ cm.^{2} Determine :

    (a) Junction capacitance at zero bias C_{jo}.

    (b) Junction capacitance at $V_a = -5$ V.

    (c) Storage capacitance at $V_a = 0.5$ V.

    (d) Can this be used as a varactor diode ? Why ?

Module 4

17. Draw and explain the labelled energy band diagrams of an *npn* transistor with uniform doping and under :

    (i) Equilibrium. (ii) Forward active.

    (iii) Saturation. (iv) Cut-off.

Or

18. Derive the expressions for α, β, γ and I_{CBO} of an *npn* transistor.

Module 5

19. With the help of neat energy band diagrams, explain the working of MOS transistor under :

    (i) Equilibrium. (ii) Negative voltage is applied.

    (iii) Positive voltage is applied. (iv) Large positive voltage applied.

Or

20. (a) Explain short channel effects in MOSFET.

    (b) Calculate the maximum width of the depletion region for an ideal MOS capacitor on *p*-type silicon with $N_A = 10^{16}$ per CC, $n_i = 1.5 \times 10^{10}$ per CC and $\varepsilon_s = \varepsilon_0 \ \varepsilon_r = 11.8 \times 8.85 \times 10^{-14}$.

($5 \times 12 = 60$ marks)