F 3156 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

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, IC]

(2010 Admission onwards—New Scheme)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Write neat and efficient C programs wherever needed.

Part A

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

1. What is the output of the following ?

```
void main ( )
{
    int i = 10 ;
    printf ("% 4d"; ++i);}
```

2. Write the syntax of "for" statement and give an example.
3. Write the number of elements in :
   (i) int mat1 [5] [5] ;
   (ii) float area [50] ;
   (iii) char page [20] ;
4. What do you mean by pointer initialization ? Give an example.
5. Name three types of preprocessor directives.

(5 × 3 = 15 marks)

Turn over

Part B

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

6. Draw the flowchart to find the largest of three integers.
7. Write a recursion to find the factorial of a positive integer.
8. Write a C program to obtain the transpose of a 5 × 5 matrix.
9. Write a C program to find the smallest in an array of n elements using pointers.
10. With necessary truth-tables, explain the bitwise AND, OR and XOR operators.

(5 × 5 = 25 marks)

Part C

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

11. Draw neat flowchart and write the C program to find the real roots of a quadratic equation.

Or

12. Using formatted I/O statements, write the C program to calculate the surface area and volume of a cube.
13. Write a C program to accept a message and count the number of vowels in it.

Or

14. (a) What is the need for function declaration ? How does function definition differ from function declaration ? Give example. (6 marks)

    (b) Explain function prototype with a suitable example. (6 marks)
15. Using structures, write a C program to accept the roll number, name and marks obtained in three subjects of the 72 students of a class and display the roll number, name, marks of the three subjects and their average.

Or

16. Write a C program to check if two given matrices are conformable for multiplication and, if so, find and print the product matrix.
17. Using pointers, write a C program to compare two strings.

Or

18. Write a C program, using pointers, to read in an array of integers and print its elements in reverse order.
19. Write a C program to count the number of words in a text file.

Or

20. Write a C program that reads a file containing integers and appends at its end, the sum of all the integers.

(5 × 12 = 60 marks)

F 3127 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Common to all Branches

EN 010 302—ECONOMICS AND COMMUNICATION SKILLS (AI, AN, AU, CE, CH, CS, EC, EE, EI, IC, IT, ME, MT, PE, PO, ST)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are the objectives of credit control ?
2. What is WTO ? What are its objectives ?
3. State the merits of indirect taxes.
4. List the different types of inflation.
5. Distinguish between free trade and protection.

(5 × 3 = 15 marks)

Part B

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

6. What is meant by credit creation ? What are the tendencies behind credit creation ?
7. Render your comments on the disinvestment of public sector undertakings.
8. What are the differences between a tax on income and tax on a commodity ? Why is a tax on income preferred in modern times ?
9. What are the major methods of measuring national income ? Explain.
10. State and explain the various items included in the balance of payments of a country.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. What are the main functions of banks ? Explain the role played by Commercial banks in the economic development of a country.

Or

12. "Stock market can be regarded as an economic barometer." Critically examine this statement in the context of Indian economy.

13. What are the measures taken by Indian Government in the case of Globalisation, Liberalisation and Privatisation. Explain their impacts on Indian economy.

Or

14. Discuss the past, present and future prospects of Information Technology industries on Indian economy.

15. (a) Distinguish between Forward and Backward shifting of tax. Explain the impact and incidence of tax. (7 marks)

(b) Explain progressive, proportional and regressive taxes with suitable examples. (5 marks)

Or

16. (a) Explain the important problems associated with deficit financing in Indian Economy. (7 marks)

(b) Define tax evasion. Explain the reasons for the same in India. (5 marks)

17. (a) Define National Income. What are its concepts ? Explain the difficulties arising in the calculation of National Income. (7 marks)

(b) Explain the significance of national income statistics. (5 marks)

Or

18. Describe the different types of inflation and their causes. What are the steps taken by the Government to control the same ? Explain.

19. What are the different types of disequilibrium in BOP ? Explain the causes for and the methods of correcting disequilibrium in BOP.

Or

20. What are the main causes of India's adverse balance of payments ? Explain the measures that have been adopted to correct the adverse balance of payments. Critically examine India's trade policy.

[5 × 12 = 60 marks]

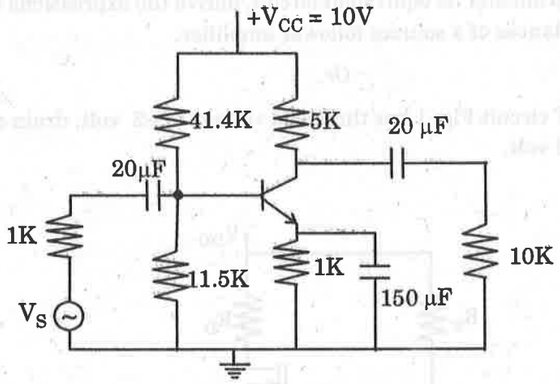


Fig. 2

Take : $\beta = 50$, $C_\pi = 100$ PF, $C_\mu = 5$PF, $C_W + C_L = 5$PF

19. Identify the type of feedback in an emitter follower amplifier circuit. Analyse the circuit to derive its gain and input resistance with feedback.

Or

20. In the ideal power amplifier shown below (fig. 3) the input is sinusoidal. Calculate

    (a) The minimum signal output power, the corresponding collector dissipation and conversion efficiency.

    (b) The maximum dissipation of each transistor and the corresponding conversion efficiency.

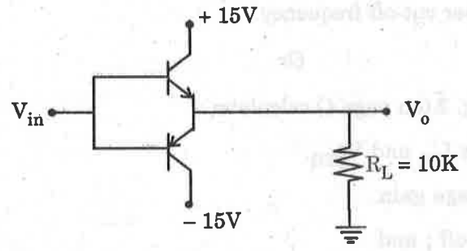


Fig. 3

(6 + 6 = 12 marks)

[5 × 12 = 60 marks]

F 3147 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

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

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

[New Scheme—2010 Admission onwards]

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Draw the circuit of a RC integrator and show how it can function as a low pass filter.
2. Compare the input resistances of CE, CC and CB configurations, giving their typical values.
3. What is meant by gate-to-source threshold voltage in E-MOSFET ?
4. If $h_{fb} = 0.978$ and $f_\alpha = 2.5$ MHz for a transistor, determine its f_β and β at the same frequency.
5. Compare the efficiencies of class A, B and AB power amplifiers.

(5 × 3 = 15 marks)

Part B

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

6. Draw a clipping circuit for limiting the output at ± 5V. Design your circuit.
7. Define the three stability factor of a common-Emitter amplifier circuit. Why the current stability factor alone is given more consideration among the three factors, while designing the circuit ?
8. An *n*-channel E-MOSFET has the following parameters : $I_{D(ON)} = 5$mA at $V_{GS} = 8$ volt and $V_{GST} = 4$ volt. Calculate the drain current when $V_{GS} = 6$ volt.
9. Draw the high frequency hybrid π equivalent circuit for a common-Emitter transistor and define the parameters of the circuit.
10. Derive the expression for A_f, the gain with feedback in a negative feedback amplifier and show that A_f is stabilised against the active device parameter changes.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Draw the complete circuit diagram of a bridge rectifier with π filter and explain the working, with necessary waveforms. Derive expression of the ripple factor of this circuit.

Or

12. A centre-tapped full wave rectifier with capacitor filter is supplying a resistive load of 250 Ω. The filter capacitor is 40 μF and the transformer secondary voltage is 35 volt r.m.s. to centre-tap at a frequency of 50 Hz. Assuming ideal diodes and neglecting transformer losses, calculate :
    (a) Ripple factor.
    (b) Output resistance of the filter.
    (c) d.c. output voltage.
    (d) d.c. load current.
    (e) Percentage load regulation ; and
    (f) Turns ratio of the transformer, assuming 230 volt, 50 Hz a.c. mains input at the primary.

(6 × 2 = 12 marks)

13. Draw the hybrid parameter equivalent circuits for the CE and CC configurations.
    (a) Subject to the restriction that $R_L = 0$. Then show that the input resistances of the two circuits are identical.
    (b) Subject to the restriction that the input is open-circuited. Then show that the output resistances of the two circuits are identical.

(6 + 6 = 12 marks)

Or

14. A transistor connected as a common-emitter amplifier is driving a load of 10 K. It is supplied by a signal source of 1 K internal resistance. The hybrid parameters of the transistor are $h_{ie} = 1100\ \Omega$, $h_{re} = 2.5 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = \frac{1}{40\ k\Omega}$. Calculate the :
    (a) Current gain.
    (b) Voltage gain.
    (c) Input resistance ; and
    (d) Output resistance.

(4 + 4 + 2 + 2 = 12 marks)

15. With a neat circuit diagram and its equivalent circuit, derive the expressions for the voltage gain, input and output impedances of a sources follower amplifier.

Or

16. The following MOSFET circuit Fig. 1 has threshold voltage of +2 volt, drain current of 8 mA at a gate-source voltage of 6 volt.

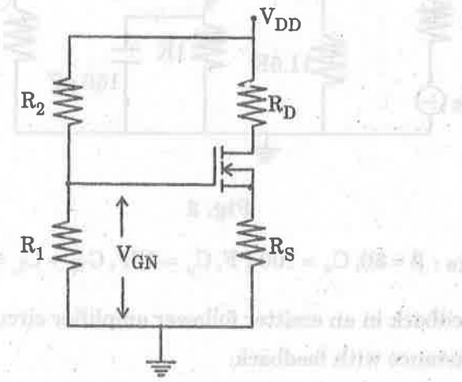


Fig. 1

    (a) Calculate the drain current for a quiescent point defined by $V_{GS} = 4$ Volt and $V_{DS} = 10$ volt.
    (b) Design the bias circuit for $V_{DD} = 24$ volt, given $R_1 = 1\ M\Omega$. Obtain R_2, R_D and R_S. Assume $V_{GN} = 12$ volt.

17. Draw the high frequency equivalent circuit for a CS, MOSFET amplifier and derive expressions for its voltage gain and upper cut-off frequency.

Or

18. For the following circuit Fig. 2 (on page 4) calculate :
    (a) The d.c. bias values I_{CQ} and V_{CEQ}.
    (b) Mid-frequency voltage gain.
    (c) Low-frequency cut-off ; and
    (d) High-frequency cut-off.

F 3137 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Applied Electronics and Instrumentation/ Electronics and Communication Engineering

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

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain direct and indirect band-gap semiconductors with examples.
2. Explain diffusion and drift currents in semiconductor with the help of expressions.
3. Define delay time, rise time and fall time in switching diode.
4. Define injection efficiency and transport factor of a BJT. How they are related to α and β ?
5. Distinguish between Enhancement and Depletion mode MOSFETs.

(5 × 3 = 15 marks)

Part B

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

6. A silicon sample is doped with 5×10^{16} Arsenic atoms/cc and 3×10^{16} Boron atoms/cc. Determine (i) electron and hole concentrations at room temperature ; and (ii) position of Fermi level. Assume $n_i = 1.5 \times 10^{10}$/cc at room temperature.
7. Calculate the contact potential of a PN junction diode having $N_A = 2 \times 10^{16}$/cc and $N_D = 5 \times 10^{13}$/cc at T = 300° K. Take $n_i = 1.5 \times 10^{10}$/cc.
8. A silicon abrupt *pn* junction at 300 K has $N_A = 2 \times 10^{16}$/cc and $N_D = 5 \times 10^{13}$/cc. The area of cross-section is 10^{-5} cm.^{2} Calculate the junction capacitance. $\epsilon_0 = 8.854 \times 10^{-14}$, $\epsilon_r = 11.8$, $n_i = 1.5 \times 10^{10}$/cc.
9. What are the different modes of operations of a transistor ? Plot minority carrier distribution for PNP transistor in all modes.
10. Explain channel length modulation in MOSFET.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Derive :

(i) $n_o = n_i\, e^{\left(\frac{E_F - E_i}{KT}\right)}$; (ii) $p_o = n_i\, e^{\left(\frac{E_i - E_F}{KT}\right)}$.

(6 + 6 = 12 marks)

Or

12. Derive the continuity equations for holes and electrons in a semiconductor. State the assumptions made.

13. Sketch and explain formation of space charge region in a PN junction. Also plot charge density, electric field, barrier potential and energy band diagram under thermal equilibrium and explain.

Or

14. What is a P^+N diode ? Derive expression for its depletion, region width. If for an abrupt P^+N diode, $N_D = 6 \times 10^{14}$/cc, $V_{BR} = 500$ volt, $\epsilon_r = 12.4$, $\epsilon_0 = 8.854 \times 10^{-14}$, calculate the depletion region width.

15. With neat sketches, explain the working and characteristics of :

(i) Zener diode.

(ii) Schottky barrier diode.

(iii) Photodiodes.

(3 × 4 = 12 marks)

Or

16. A 0.45 μm, thick sample of GaAs is illuminated with monochromatic light of $h\upsilon = 2$ eV. The absorption coefficient is 5×10^4/cm. The power incident on the sample is 10 mW.

(i) Calculate the total energy absorbed by the sample per second (J/S).

(ii) Find the rate of excess thermal energy given up by the electrons to the lattice before recombination (J/S).

(iii) Find the number of photons per second given off from recombination events assuming perfect quantum efficiency.

(3 × 4 = 12 marks)

17. With necessary diagrams, explain :

(i) Effect of base narrowing in BJT.

(ii) Punch through effect.

(iii) Emitter crowding.

(3 × 4 = 12 marks)

Or

18. With neat sketches, explain the shape of depletion region, with a cross-sectional view of JFET. Explain pinch-off, saturation and the effect of negative gate bias with the help of VI characteristics.

19. (a) With neat constructional diagram and energy band diagrams, explain MOS capacitor.

(b) Calculate the maximum width of the depletion region for an ideal MOS capacitor on *p*-type silicon with $N_A = 10^{16}$/CC, $n_i = 1.5 \times 10^{10}$/CC. $\epsilon_r = 11.8$, $\epsilon_0 = 8.854 \times 10^{-14}$.

(7 + 5 = 12 marks)

Or

20. With neat constructional diagram and characteristic curves, explain the working of IGBT. What are its merits compared to conventional transistors ?

(5 × 12 = 60 marks)

17. A series RLC circuit, with R = 180 Ω, L = 0.5 H and C = 100 μF, has a sinusoidal voltage source $v = 500 \sin (500\, t + \phi)$ volts. Find from basics, using Laplace Transform, an expression for the resulting current, if the switch is closed at a time corresponding to $\phi = 45°$. Find the value of current 0.05 second after switching on.

Or

18. A series circuit has R = 0.5 Ω and L = 0.2 H and C = 2F. It is connected to a constant voltage variable frequency supply :

(a) Find the driving point admittance and plot its poles and zeros.

(b) Using the pole-zero plot, find expressions for amplitude response and phase response.

(c) Find magnitude and phase of admittance function at $w = 1$.

19. (a) Determine the hybrid parameters of the network shown in Fig. 7 below :

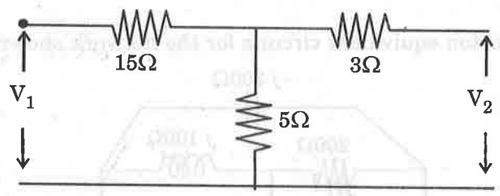


Fig. 7

(6 marks)

(b) Two 2-port networks, N_1 and N_2 are interconnected such that their input ports are in series and the output ports are in parallel. If H_1 and H_2 are the hybrid parameter matrices of N_1 and N_2 respectively, show from basis that the hybrid parameter matrix of the interconnection is $H = H_1 + H_2$.

Or

20. A certain network has a specified transfer function. Obtain the expressions for $a(w)$ and $\theta(w)$ given that $H(s) = \frac{(s+20)}{5(s+4)}$. Then find the steady state output $y(t)$ when the input is $x(t) = \cos 2t + \cos 10\, t + \cos 50\, t$.

(5 × 12 = 60 marks)

F 3128 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

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

AI 010 303/EC 010 303/EI 010 303/IC 010 303—NETWORK THEORY [AI, EC, EI, IC]

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Assume any missing data suitably.

Part A

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

1. State Superposition theorem as applied to d.c. circuits.
2. Obtain impulse response of a series RL circuit.
3. Write the steps in nodal analysis of solving an electrical network.
4. Find the Laplace Transform of e^{at}.
5. Define the transmission parameters of a *two*-port network.

(5 × 3 = 15 marks)

Part B

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

6. Use source transformation to calculate the current I in the network ? Fig. 1

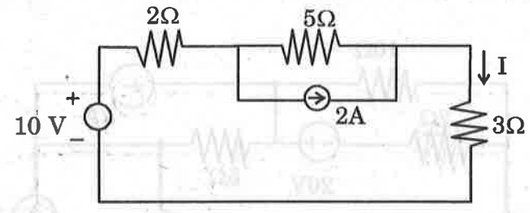


Fig. 1

7. Initially relaxed inductances of 2, 4, 5 Henries are connected in parallel across a 12 A source at $t = 0$. Find the currents in them at $t = 0^+$.

8. Two coils having 800 turns and 1400 turns respectively are placed close to each other such that, 60 % of the flux produced by one coil links the other. If a current of 10A flouring in the first coil produces a flux of 0.5 mWb, find the inductance of the second coil.

9. Find the inverse Laplace Transforms of :

$$\frac{s^2 + 3}{\left(s^2 + 2s + 5\right)(s + 2)}.$$

10. Explain the condition for symmetry for two-port network. Show the symmetry for *z*-parameters.

(5 × 5 = 25 marks)

Part C

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

11. Find "*i*" in the circuit shown in Fig. 2 using Superposition theorem :

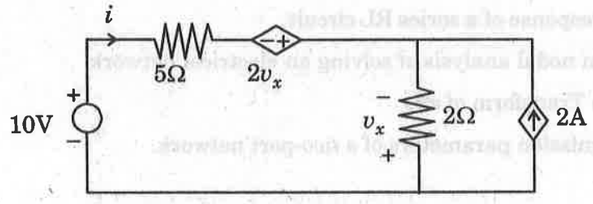


Fig. 2

Or

12. What is the value of R such that maximum power transfer takes place from the sources to R in the circuit shown in Fig. 3 ? Determine the amount of the maximum power :

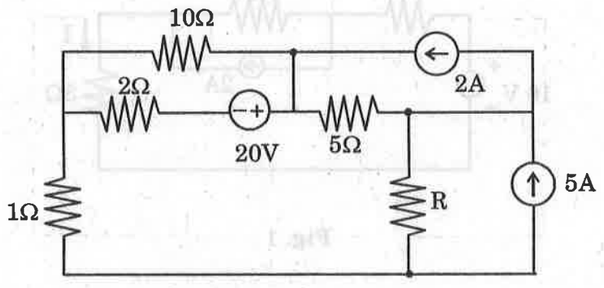


Fig. 3

13. At time $t = 0$, the switch K is opened for the network shown in Fig. 4. Find $V_1(t)$ and $V_2(t)$ for $t \geq 0$.

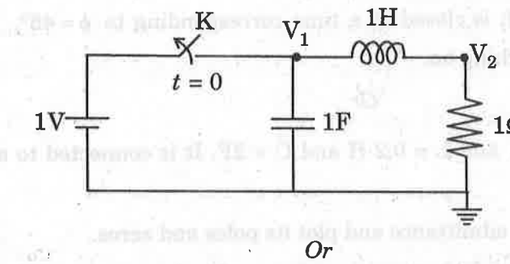


Fig. 4

Or

14. A series RLC circuit with zero initial conditions is connected to 110 V d.c. source at $t = 0$. If L = 1H, $C = \frac{1}{16}$ F and R is (a) 4 Ω ; (b) 8 Ω, find $i(t)$ in the circuit in both cases and plot it.

(6 + 6 = 12 marks)

15. Find the Thevenin and Norton equivalent circuits for the network shown in Fig. 5.

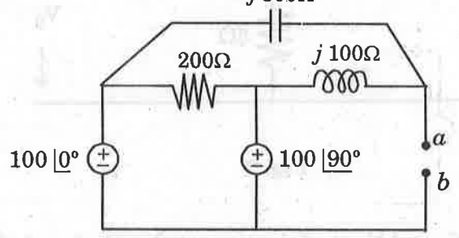


Fig. 5

Or

16. Calculate the current I_x using (a) nodal analysis ; and (b) mesh analysis and verify the result for the network in Fig. 6.

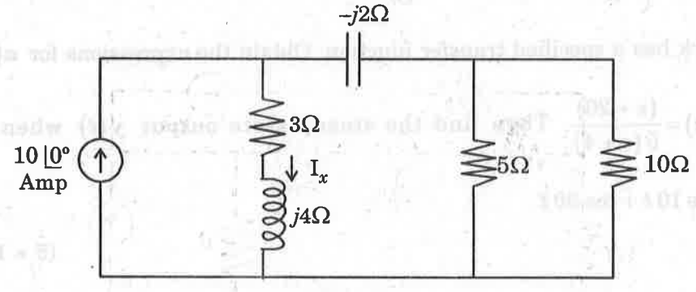


Fig. 6

Turn over

19. (a) Using $z(n) = \frac{z}{(z-1)^2}$, show that $z(n\cos n\theta) = \frac{\left(z^3+z\right)\cos\theta - 2z^2}{\left(z^2-2z\cos\theta+1\right)^2}$.

(b) Using convolution theorem, find the inverse z-transform of $\frac{8z^2}{(2z-1)(4z-1)}$.

Or

20. (a) Solve the following using z-transforms :

$$y(n) - y(n-1) = u(n) + u(n-1).$$

(b) Given $z(u_n) = \frac{2z^2+3z+4}{(z-3)^3}, |z| > 3$, show that $u_1 = 2, u_2 = 21, u_3 = 139$.

(5 × 12 = 60 marks)

F 3125 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

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, PO, MT, CH AND ST)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary/ST—Regular]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Find grad ϕ if $\phi = \log\left(x^2+y^2+z^2\right)$.

2. If $\vec{f}(t) = t\,\hat{i} + \left(t^2-2t\right)\hat{j} + \left(3t^2+4t^3\right)\hat{k}$, find $\int_0 \vec{f}(t)\,dt$.

3. Evaluate $\Delta^2 \mathrm{E}^3 x^2$.

4. Solve $\left(\mathrm{E}^2+6\mathrm{E}+9\right) y_n = 0$.

5. Find the z-transform of $3^n \sin\frac{n\pi}{2}$.

(5 × 3 = 15 marks)

Part B

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

6. The position vector of a particle at time t is $\vec{r} = \cos(t-1)\,\hat{i} + \sinh(t-1)\,\hat{j} + \alpha r^3\,\hat{k}$. Find the condition imposed on α by requiring that at time $t = 1$, the acceleration is normal to the position vector.

7. Find the work done when a force $\vec{F} = \left(x^2 - y^2 + x\right)\hat{i} - (2xy + y)\,\hat{j}$ moves a particle in the xy plane from $(0, 0)$ to $(1, 1)$ along the parabola $y^2 = x$.

8. Prove that $\delta = \Delta\ (1 + \Delta)^{-1/2} = \nabla\,(1 - \nabla)^{-1/2}$.

9. Solve the difference equation $y_{n+2} + 3y_{n+1} + 2y_n = \sin\dfrac{n\pi}{2}$.

10. Find the inverse z-transform of $\dfrac{4 - 8z^{-1} + 6z^{-2}}{\left(1 + z^{-1}\right)\left(1 - 2z^{-1}\right)}$.

(5 × 5 = 25 marks)

Part C

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

11. (a) The temperature at a point (x, y, z) in space is given $T(x, y, z) = x^2 + y^2 - z$. A mosquito located at $(1, 1, 2)$ desires to fly in such a direction that it will get warm as soon as possible. In what direction should it fly ?

(b) Find the constants a, b, c, so that $\vec{F} = (x + 2y + az)\,\hat{i} + (bx - 3y - z)\,\hat{j} + (4x + cy + 2z)\,\hat{k}$ is irrotational.

Or

12. (a) A particle moves along the curve $\vec{r}\left(r^3 - 4t\right)\hat{i} + \left(t^2 + 4t\right)\hat{j} + \left(8t^2 - 3t^3\right)\hat{k}$ where t is the time. Find the magnitudes of acceleration along the tangent and normal at time $t = 2$.

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

13. (a) Evaluate the line integrals $\int_C \left\{\left(x^2 + xy\right)dx + \left(x^2 + y^2\right)dy\right\}$ where C is the square formed by the lines $y = \pm 1$ and $x = \pm 1$.

(b) Find the circulation of $\vec{F}$ round the curve C, where $\vec{F} = e^x \sin(y)\,\hat{i} + e^x \cos(y)\,\hat{j}$ C is the rectangle whose vertices are (0, 0), (1, 0), $\left(1, \dfrac{\pi}{2}\right)$ and $\left(0, \pi/2\right)$.

Or

14. Apply stoke's theorem to evaluate $\int_C \left[(x + y)\,dx + (2x - z)\,dy + (y + z)\,dz\right]$ where C is the boundary of the triangle with vertices (2, 0, 0), (0, 3, 0) and (0, 0, 6).

15. Find the interpolation the missing values in the following data :

x	:	0	5	10	15	20	25
y	:	6	10	–	17	–	31

Or

16. Use Newton's divided difference formula to find $f(7)$, if $f(3) = 24$, $f(5) = 120$, $f(8) = 502$, $f(9) = 720$, $f(12) = 1616$.

Or

17. Apply Simpson's rule to find the are a abounded by the x-axis, the lines $x = 1$, $x = 4$ and the curve through the points.

x	:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	:	2.0	2.4	2.7	2.8	3.0	2.6	2.1

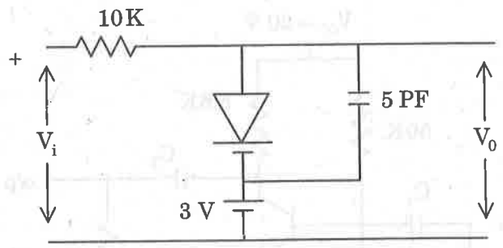
Or

18. Find the complete solution for the following :

(a) $y_{n+2} - 4y_{n+1} + 4y_n = 3n + 2^n$.

(b) $u_{x+2} - 2m\,u_{x+1} + \left(m^2 + n^2\right)u_x = m^x$.

19. The input voltage V_i to the clipper shown in the figure below, is a 1.0 μ sec. pulse whose voltage varies between 0 and 10 V. The forward diode resistance is R_f = 100 Ω, V_γ = 0.5 V and R_r = 100 MΩ. Sketch the output voltage waveform V_0 and indicate the time constants of the exponential portions.



Or

20. Transform a symmetrical collector coupled astable multivibrator into a voltage controlled oscillator. With circuit diagrams and waveforms, explain. Derive an expression to quantify the frequency of oscillations.

(5 × 12 = 60 marks)

F 3112 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

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

ELECTRONIC CIRCUITS–I (LAS)

(Prior to 2010 Admissions—Old Scheme)

(Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Derive the expressions and values of (i) rectification efficiency and (ii) TUF of half-wave rectifier.
2. Draw the complete circuit diagram of a bridge wave rectifier using C filter.
3. Why is the input resistance of CB configuration very low, and medium in the case of CE configuration, eventhough the same base-emitter junction is at the input port in both CE and CB ?
4. Sketch the characteristics to explain how h_{ib} is determined.
5. Why does the potential divider bias circuit become universal ?
6. How thermistor is used to provide bias compensation in an amplifier circuit ? Explain.
7. How does the values of C_{C_1} and C_{C_2} and C_E affect the lower cut-off frequency ?
8. What is a source follower ? Explain.
9. What is a bottom clipper ? Explain its working with a typical circuit diagram.
10. Explain rise time and fall time of a BJT used as a switch.

(10 × 4 = 40 marks)

Part B

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

11. A 100 μF capacitor, when used as filtering element, has 12 V DC across it with a terminal load voltage of 2 kΩ. If the rectifier is full-wave and supply voltage frequency is 50 Hz, wheat is the percentage of ripple in the output ? Derive the formula used.

Or

12. A 100 mA zener diode maintains a voltage of 5 V across its terminals while carrying currents of 5 mA to 100 mA through it. A 60 Ω resistor is connected in series with this zener, and the combination is used as a 5 V shunt regulator for a resistive load. If the load takes a current between 35 mA and 70 mA at 5 V, and the input supply varies between 10 V and 12.5 V d.c., check if the voltage regulator will function satisfactorily.

13. Give the comparison between the three different configurations of BJT with respect to their properties and applications. Give one circuit example for each configuration.

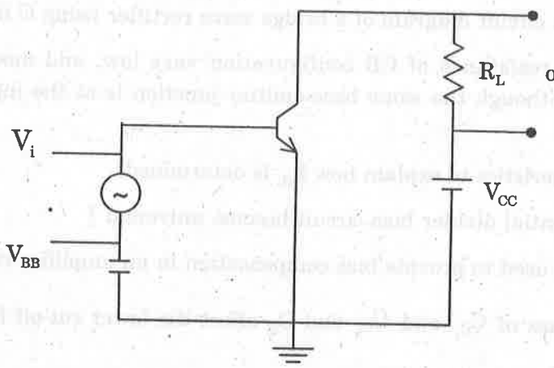
Or

14. Draw the input and output characteristics of CB configuration. Indicate operating regions on both the above characteristics and clearly explain the shape of the characteristics.

15. For a CE amplifier with voltage divider biasing, explain the operating point selection on (i) input and (ii) output characteristics. Also sketch and explain the d.c. load line on the output characteristics.

Or

16. For the circuit shown below the d.c. bias is fixed for I_C = 1 mA and V_{CE} = 5V.



(i) Draw the small signal equivalent circuit model with β = 50, h_{ie} = 1 KΩ.

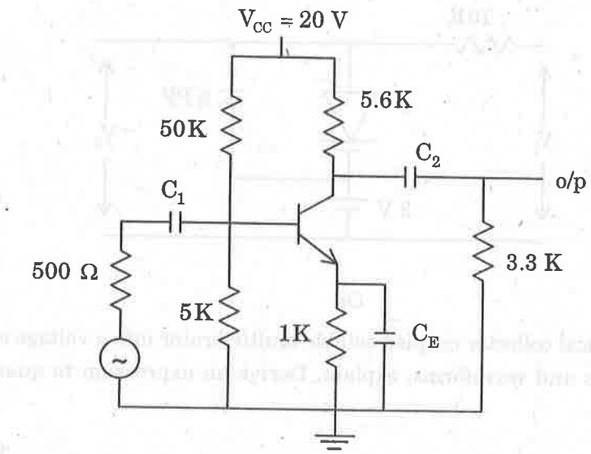
(ii) Specify R_L for a voltage gain $\frac{v_o}{v_i} = 160$.

(iii) Specify the battery voltage V_{CC}.

17. For the circuit shown below :

(i) Determine the corner frequencies in the low-frequency band due to the three capacitance (C_1, C_2, C_E). What is the cut-off frequency of this band ?

(ii) Calculate the midband voltage gain



$C_1 = C_2$ = 1 μF

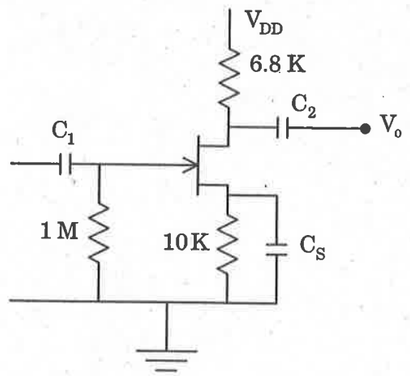
C_E = 50 μF, β = 100

Or

18. For the FET amplifier circuit shown below :

(i) Calculate the midfrequency voltage gain and

(ii) The lower cut-off frequency of the circuit.



$C_1 = C_2$ = 0.01 μF

C_S = 15 μF

μ = 70

r_d = 30 K

F 3104 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

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

SOLID STATE DEVICES (L A S)

(Prior to 2010 Admissions—Old Scheme)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Distinguish between direct and indirect bandgap semiconductors ? Give examples.
2. Explain the conduction process by holes.
3. List and briefly explain the properties of depletion region of a *pn* junction.
4. What are the differences between Zener and Avalanche breakdown ?
5. What is a varactor diode ? What are its applications ?
6. Draw the VI characteristics of a tunnel diode and label it.
7. Explain the doping profile in BJT and what is its significance.
8. What is Schottky transistor ? What are its applications ?
9. Define :
   (i) pinch-off voltage ; (ii) threshold voltage ;
   (iii) saturation voltage ; and (iv) breakdown voltage of a JFET.
10. What are the precautions to be taken while handling MOSFET ? Why ?

(10 × 4 = 40 marks)

Part B

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

11. In a semiconductor at room temperature of 27°C, the intrinsic carrier concentration and resistivity are 1.5×10^{16} /m^3 and 2×10^3 Ωm respectively. It is converted to an extrinsic semiconductor with a doping concentration of $10^{20} m^3$. For extrinsic semiconductor calculate :

Turn over

(a) Minority carrier concentration ;

(b) resistivity ;

(c) shift in Fermi-level due to doping ; and

(d) Minority carrier concentration when its temperature is raised to a value at which intrinsic carrier concentration doubles. Assume $\mu_n = \mu_p = 2000$ cm^2/Vs, kT = 26 mV at room temperature.

Or

12. (a) Derive the expression for the minimum conductivity of a semiconductor.

(b) Explain the transient decay of excess carriers in a semiconductor with direct recombination. Explain minority carrier life time.

13. In a p^+nn^+ junction diode, made of silicon the doping concentration of n-region is 5×10^{15} /cc. If the circuit field at avalanche breakdown is 3×10^5 V/cm, find :

(a) the breakdown voltage if the width of n-region is (i) 10 μm ; (ii) 5 μm ; (iii) 1 μm.

(b) Sketch and label the electric field distribution.

Or

14. Sketch the profiles and derive expressions for :

(i) build-in potential ;

(ii) electric - field distribution ;

(iii) depletion layer capacitance of a linearly graded p-n junction.

15. (a) Derive expression for the time variation of voltage across a p-n junction as it is switched from forward-bias to reverse-bias condition.

(8 marks)

(b) Draw the characteristics of a tunnel diode and explain.

(4 marks)

Or

16. (a) Derive the expression for conductance of a diode. How does it vary with variation in forward-bias ?

(b) What is Zener diode and how does it regulate the voltage ?

17. Plot the minority carrier distribution in a p-n-p BJT in all the three regions and label it properly for (i) active region ; (ii) cut-off region ; and (iii) saturation region.

Or

18. Draw the n-p-n and p-n-p transistors. Label all the currents when biased in active region and show the direction of carrier flow in both types of transistors ? Derive expressions for the current components.

19. A silicon MOS system with p-type substrate with $N_A = 10^{15}$/cc, oxide thickness = 100 Å, is at the onset of strong inversion. Determine :

(a) width of depletion layer ;

(b) the charge density in the depletion layer ;

(c) the electron density n_s at the surface ; and

(d) the threshold voltage. Assume $\epsilon_{rox} = 3.9$, $n_i = 1.5 \times 10^{10}$/cc.

Or

20. Derive expression for the drain current of JFET. What are the approximations made ? Explain the effect of increase in temperature on the drain current.

(5 × 12 = 60 marks)

F 3095 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

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

ELECTRICAL TECHNOLOGY (LAS)

(Prior to 2010 Admissions—Old Scheme)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the function of commutator in a dc generator.
2. What are the reasons for drop of terminal voltage of a dc shunt generator when loaded ?
3. What is the necessity of a starter for a d.c. motor ? Why small motors can be switched directly ?
4. Explain the significance of back e.m.f. in the operation of a dc motor under loaded condition.
5. Derive an e.m.f. equation for a single phase transformer and deduce expression for transformation ratio.
6. List the advantages and applications of an autotransformer.
7. Explain any one method of starting of a synchronous motor.
8. Draw and explain torque-slip characteristics of a 3-phase induction motor.
9. Explain the constructional features of a servo motor.
10. What are the types of AC conductors ? Explain.

(10 × 4 = 40 marks)

Part B

Answer **either** A **or** B *of each questions.*
Each full question carries 12 *marks.*

11. A (i) Explain the critical field resistance of a dc shunt generator. (4 marks)

(ii) For a 200V, long shunt compound generator, the resistance of the armature, shunt field and series windings are 0.06 Ω, 25 Ω and 0.04 Ω respectively. When a load of 20 kW at 200V is connected across its terminals, calculate the induced voltage. (8 marks)

Or

Turn over

B (i) A dc. generator fails to self excite at rated speed. Why ? (4 marks)

(ii) A 500 V, 10 pole d.c. shunt generator supplies a load of 500 kW at rated voltage and runs at 750 r.p.m.. The shunt field resistance is 500 Ω and armature resistance is 0.01 Ω. Calculate the armature current and induced voltage. (8 marks)

12. A (i) Explain how torque is produced in a d.c. motor. (4 marks)

(ii) A 250 V shunt motor takes a total current on full load and 5A on no-load. If the no-load speed is 1000 r.p.m, What is the speed at full load ? Ra = 0.3 Ω, Rsh = 250 Ω. (8 marks)

Or

B (i) Explain the applications of d.c. series motors. (4 marks)

(ii) A d.c. series motor, connected to 440 V supply runs at 600 r.p.m., when taking a current of 50A. Calculate the value of the resistor which when inserted in series with the motor, will reduce the speed to 400 r.p.m., with the gross torque being then half of its previous value. Resistance of the motor is 0.2 Ω. Assume the flux to be proportional to the field current. (8 marks)

13. A (i) Define efficiency of a transformer. Derive an expression for maximum efficiency of a transformer. (4 marks)

(ii) A 200 V/400V transformer $r_1 = 0.2\ \Omega, x_1 = 0.5\ \Omega, r_2 = 0.75$ and $x_2 = 2\ \Omega$. Find the secondary terminal voltage when supplying 10A at 0.8 pf lag. (8 marks)

Or

B) (i) Explain how the primary responds to a secondary load current. Draw and explain the phasor diagram if the transformer supplying a leading pf load. (8 marks)

(ii) A 4 KVA, 200/400V, 50 Hz transformer draws a current of 2A at a pf of 0.2. What is the primary current when the secondary is connected to a load that draws full load current at 0.8 pf lag. (4 marks)

14. A (i) What are the advantages of housing excitation for an alternator on rotor ? Explain. (4 marks)

(ii) A 3 phase, 500V, induction motor has a stator impedance of $0.062 + j\,0.22\ \Omega$. The equivalent rotor impedance at stand still is the same. The magnetising current is 3.5 A, the core loss is 1500 W, and the mechanical loss is 750 W. Estimate the output, efficiency and power factor at a ship of 2%. (8 marks)

Or

(b) (i) Show that the maximum torque developed by an induction motor is independent of rotor resistance. (4 marks)

(ii) Describe e.m.f. method of obtaining regulation of an alternator for lagging and leading power factor load. (8 marks)

15. A With neat figures, explain the constructional details, working and applications of stepper motor.

Or

B Describe the construction, working and applications of tachogenerators.

(5 × 12 = 60 marks)

10. (a) From the following data :

x	:	0.00	0.05	0.10	0.15	0.20	0.25
y	:	0.00000	0.10018	0.20132	0.30458	0.41075	0.52110

Evaluate $\frac{dy}{dx}$ at $x = 1.00$.

(b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$ and $x = 1.6$.

x	:	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	:	7.989	8.413	8.782	9.129	9.452	9.750	10.022

(5 × 20 = 100 marks)

F 3081 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Common to all Branches except Computer Science and Information Technology

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(Old Scheme—Prior to 2010 admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

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

Module 1

1. (a) Verify the formula, $\frac{d}{dt}\left(\vec{A}\cdot\vec{B}\right) = \vec{A}\cdot\frac{d\vec{B}}{dt} + \frac{d\vec{A}}{dt}\cdot\vec{B}$ for $\vec{A} = 5t^2\hat{i} + t\,\hat{j} - t^3\hat{K}, \vec{B} = \sin t\,\hat{i} - \cos t\;\hat{j}$.

(b) A particle (position vector $\vec{r}$) is moving in a circle with constant angular velocity w. Show by vector methods, that the acceleration is equal to $-w^2\vec{r}$.

(c) If $u = x^2 + y^2 + z^2$ and $\vec{V} = x\,\hat{i} + y\,\hat{j} + z\,\hat{k}$, show that $\text{div}\left(u\vec{V}\right) = 5u$.

Or

2. (a) If $u = x + y + z$, $v = x^2 + y^2 + z^2, w = yz + zx + xy$, prove that :

$(\text{grad}\,u)\cdot\left[(\text{grad}(V))\times(\text{grad}(w))\right] = 0$.

(b) Show that the vector field $\vec{A}$, where $\vec{A} = \left(x^2 - y^2 + x\right)i - (2xy + y)\,\hat{j}$ is irrotational, and find the scalar ϕ such that $A = \text{grad}\,\phi$.

Module 2

3. (a) Find the work done in moving a particle once round the circle $x^2 + y^2 = 9$ in the x-y-plane if the field of force is $\vec{F} = (2x - y - z)\,\hat{i} + \left(x + y - z^2\right)\hat{j} + (3x - 2y + 4z)\,\hat{k}$.

(b) Show that $\iint_S \vec{F}\cdot\hat{n}\,dS = \frac{3}{2}$, where $\vec{F} = 4xz\,\hat{i} - y^2\,\hat{j} + yz\,\hat{k}$ and S is the surface of the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.

(c) Use divergence theorem to show that $\oint_C r^n \vec{r}\cdot d\vec{S} = (n+3) = \int_V r^n dV (n \neq -3)$.

Or

4. (a) If S is any closed surface enclosing a volume V and $\vec{F} = x\,\hat{i} + 2y\,\hat{j} + 3z\,\hat{k}$, prove that

$$\iint_S \vec{F}\cdot\vec{n}\,dS = 6V$$

(b) Verify Stoke's theorem for the function $\vec{F} = x^2\,\hat{i} + xy\,\hat{j}$ integrated round the square whose sides are $x = 0, y = 0, x = a$ and $y = a$ in the plane $z = 0$.

(c) The acceleration of a particle at any time t is given by $\vec{a} = 12\cos 2t\,\hat{i} - 8\sin 2t\,\hat{j} + 16t\,\hat{k}$. If the velocity $\vec{v}$ and displacement $\vec{r}$ are zero at $t = 0$, find $\vec{v}$ and $\vec{r}$ at any time t_i.

Module 3

5. (a) If z_0 is the upper half of the z-plane, show that the bilinear transformation $w = e^{i\alpha}\left(\frac{z - z_0}{z - z_0}\right)$ maps the upper half of the z-plane into the interior of the unit circle at the origin in the w-plane.

(b) Find the analytic function whose real part is $e^x(x\cos y - y\sin y)$.

(c) Show that the transform $w = z + \frac{(a^2 - b^2)}{4z}$ transforms the circle of radius $\frac{a+b}{2}$, centre at the origin, in the z-plane into ellipse of semi-axes a, b in the w-plane.

Or

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

(b) If $w = \phi + i\psi$ represents the complex potential for an electric field and $\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$, determine the function ϕ.

(c) Under the transformation $w = \frac{z - i}{1 - iz}$, find the map of the circle $|z| = 1$ in the w-plane.

Module 4

7. (a) Evaluate $\Delta^2 \cos(cx + d)$, the interval of differencing being h.

(b) If $u_0 = 3, u_1 = 12, u_2 = 81, u_3 = 200, u_4 = 100, u_5 = 8$, find the value of $\Delta^5 u_0$.

(c) A function $f(x)$ is given by the following table. Find $f(0.2)$ by a suitable formula :

x :	0	1	2	3	4	5	6
$f(x)$:	178	183	190	202	218	222	230

Or

8. (a) Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the following table of x and y is given :

x :	5	6	9	11
y :	12	13	14	16

(b) Apply Stirling's formula to find $f(0.42)$ if $f(0.30) = 0.1179, f(0.35) = 0.1368, f(0.40) = 0.1554, f(0.45) = 0.1736, f(0.50) = 0.1915$.

Module 5

9. (a) The following table gives the values of a function at equal intervals :

x :	0.0	0.5	1.0	1.5	2.0
$f(x)$:	0.3988	0.3522	0.2421	0.1290	0.0541

Evaluate $f(1.8), f'(1.5)$ and $\int_0^2 f(x)\,dx$, stating the formula used. (15 marks)

(b) Solve $u_{n+2} - 7u_{n+1} + 10u_n = 12e^{3n} + 4^n$. (5 marks)

Or

F 3086 (Pages : 6) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

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

NETWORK THEORY (L A S)

(Prior to 2010 Admissions—Old Scheme)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Two inductively coupled coils have self inductance $L_1 = 40$ mH and $L_2 = 180$ mH. If the Coefficient of coupling is 0.6, (a) find the value of mutual inductance between the coils, (ii) what is the maximum possible mutual inductance ?
2. Write a note on dependent and independent sources with help of neat sketches and practical examples for the sources.
3. State and explain Millman's theorem.
4. Explain the incidence matrix with an example graph.
5. Calculate the value of initial current in a series RL circuit with $R = 100\ \Omega$, $L = 8$ H with a battery supply of 10 V.
6. State and prove final value theorem of Laplace Transforms.
7. Briefly explain the open circuit impedance parameter and transmission parameter.
8. The z-parameters of a two port network is $\begin{bmatrix} 5 & 10 \\ 3 & 4 \end{bmatrix}$. Find its h-parameters.
9. List the properties of a positive real function. What is the significance of each ?
10. Compare the properties of Foster and caver forms of networks.

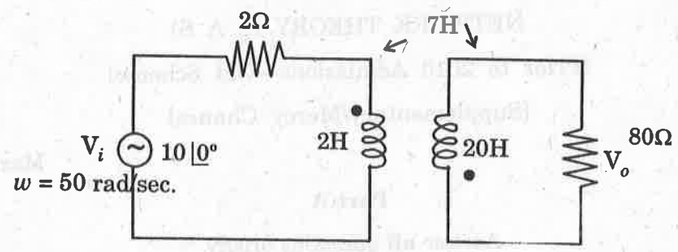
(10 × 4 = 40 marks)

Turn over

Part B

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

11. (a) For the circuit shown below, find the ratio of output voltage to the input voltage.

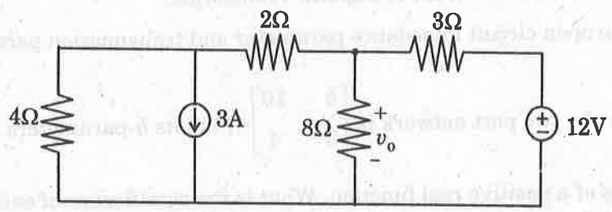


(b) The inductance matrix for the circuit of a three series connected coupled coils is given below. Calculate the inductances and indicate the dots for the coils.

$$L = \begin{bmatrix} 6 & -2 & 1 \\ -1 & 3 & -5 \\ 1 & -6 & -6 \end{bmatrix}.$$

Or

12. (a) For the following circuit, $v_0 = 3.2$ V. Find v_0 if both the independent sources are doubled ?



18. (a) Realise a constant k low-pass filter to cut-off at 1.1 kHz with a terminating resistance of 600 Ω. Draw the circuit.

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

19. (a) Test for positive real function property of :

$$\frac{s^3 + 10s^2 + 30s + 16}{s^2 + 7s + 10}.$$

(b) Test whether the polynomial $s^7 + s^5 + s^3 + s$ is Hurwitz ?

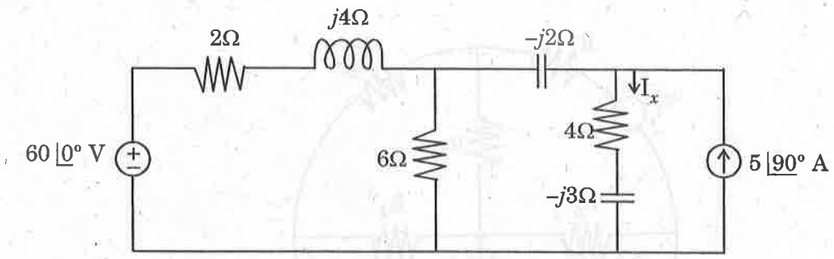
Or

20. (a) Determine the condition for $N(s) = \frac{s^2 + \alpha s + \beta}{s^2 + \gamma s + \delta}$ to be positive real functions, when α, β, γ and δ are real constants.

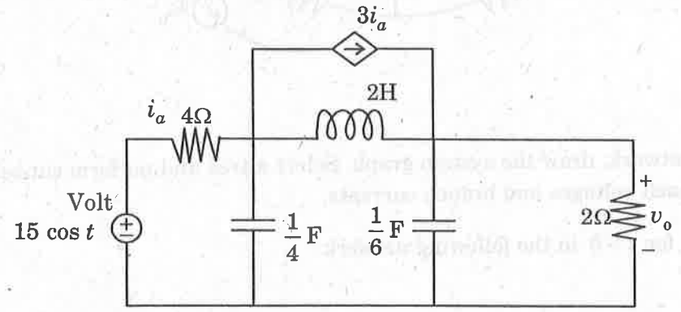
(b) Realise the RC driving point impedance $N(s) = \frac{s^2 + 7s + 10}{s^2 + 4s + 3}$ in Foster II form.

(5 × 12 = 60 marks)

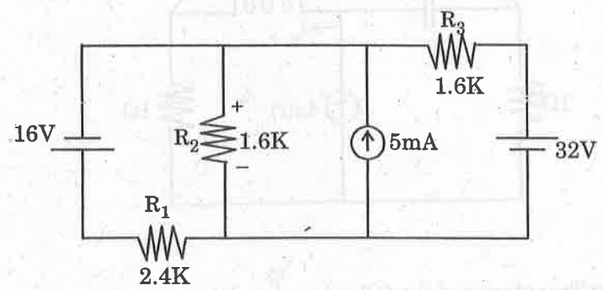
(b) Use the method of source transformations to find I_x in the following circuit :



13. (a) Using Thevenin's theorem, find v_o in the given circuit below :

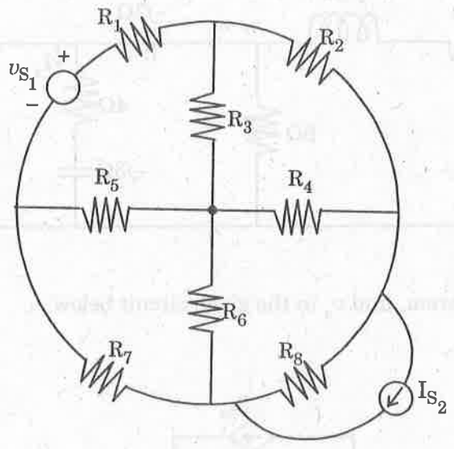


(b) Determine the voltage drop across R_2 of the circuit below using superposition theorem :



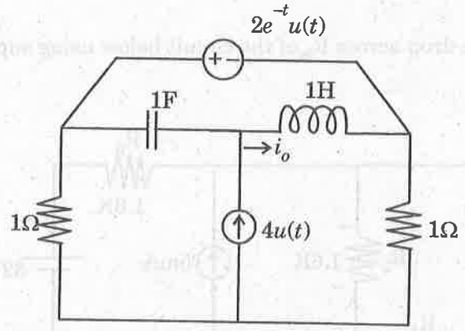
Or

14.



For the above network, draw the system graph. Select a tree and perform cut-set schedule. Also calculate all branch voltages and branch currents.

15. (a) Find $i_0(t)$ for $t > 0$ in the following network :



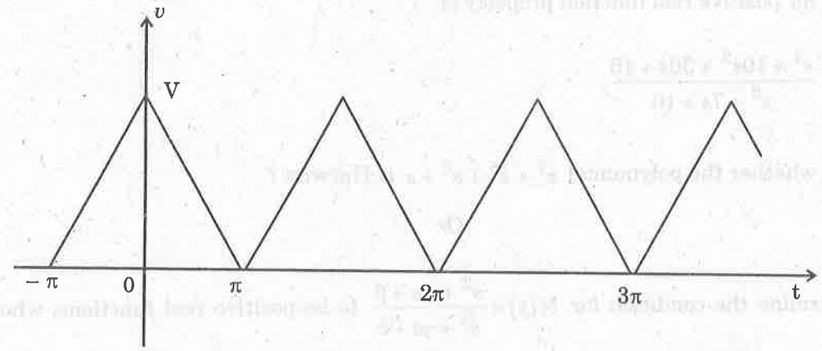
(b) Find the Laplace Transforms of the following signals :

(i) Sin (wt) u (t) ; and (ii) cos (wt) u (t).

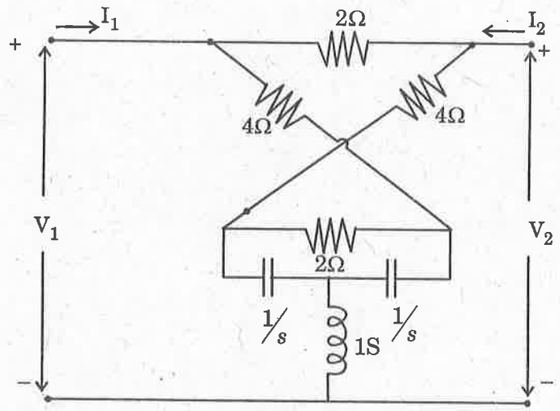
Or

16. (a) Derive the Fourier series for the exponential form. Write the equations for evaluating the coefficients.

(b) Find the Fourier series representation for the triangular wave shown below :



17. Find the z-parameters of the circuit shown below :—



Or