B.Tech. Degree III Semester Examination November 2013

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 301 ENGINEERING MATHEMATICS II

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Examine the following system of equations for consistency

$$2x - 3y + 7z = 5$$
$$3x + y - 3z = 13$$
$$2x + 19y - 47z = 32$$

(b) Let $V_1 = (1,-1,0)$, $V_2 = (0,1,-1)$ and $V_3 = (0,0,1)$ be elements of R^3. Show that the set of vectors $\{V_1, V_2, V3\}$ is linearly independent.

(c) Obtain the Fourier series of $f(x) = |x|$ in $-\pi < x < \pi$, $f(x+2\pi) = f(x)$

(d) Find the Fourier cosine transform of

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \\ 0 & \text{for } x > 2 \end{cases}$$

(e) Find the Laplace transform of $\dfrac{\cos at - \cos bt}{t}$.

(f) Find the inverse Laplace transform of $\log\left(\dfrac{s+a}{s+b}\right)$

(g) Find a unit vector perpendicular to the surface $x^3 - xyz + z^3 = 1$ at $(1, 1, 1)$.

(h) Find the work done in moving a particle in the force field $F = 3x^2\vec{e} + (2xz - y)\vec{j} + z\vec{k}$ along the straight line from (0, 0, 0) to (2, 1, 3).

PART B

$(4 \times 15 = 60)$

II. (a) Using elementary transformation reduce the following matrix to its normal form. (7)

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$$

(b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (8)

OR

III. (a) Using Cayley Hamilton theorem find A^{-1} if $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. (8)

(b) $T : R^4 \to R^3$ (7)

$$T\begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} x + y + w \\ z \\ y + 2w \end{bmatrix}.$$

Find $Ker(T)$ and $ran(T)$ and their dimensions.

(P.T.O.)

IV. (a) Obtain a half range cosine series for (8)

$$f(m) = kx \quad \text{for } 0 \le x \le \ell/2$$
$$= k(\ell - x) \quad \text{for } \ell/2 \le x \le \ell$$

Deduce the sum of the series $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$

(b) Solve the integral equation (7)

$$\int_0^\infty f(x) \sin tx \, dx = 1 \quad 0 \le t < 1$$
$$2 \quad 1 \le t < 2$$
$$0 \quad t \ge 2$$

OR

V. (a) If $f(x) = |\cos x|$ expand $f(x)$ as a Fourier series in the interval $(-\pi, \pi)$. (8)

(b) Using the Fourier integral representation show that (7)

$$\int_0^\infty \frac{\omega \sin x\omega}{1+\omega^2} d\omega = \frac{\pi}{2} e^{-x} \quad (x > 0).$$

VI. (a) Find the Laplace transform of the periodic function and using this find the Laplace transform of the function (10)

$$f(t) = \sin \omega t \quad 0 < t < \pi/\omega$$
$$0 \quad \pi/\omega < t < \frac{2\pi}{\omega}$$

(b) Apply convolution theorem to evaluate $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$. (5)

OR

VII. (a) Use Laplace transform method to solve $\frac{d^2x}{dt^2} + 9x = \cos 2t$ if $x(0) = 1$, $x(\pi/2) = -1$. (5)

(b) Find the inverse Laplace transform (10)

(i) $\frac{s+1}{s^2+4s+5}$

(ii) $\frac{s^2+6}{(s^2+1)(s^2+4)}$

VIII. (a) Prove that $curl(grad\,\phi) = 0$. (6)

(b) Apply Stoke's theorem to evaluate $\int_C ydx + zdy + xdz$ where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$. (9)

OR

IX. (a) Verify divergence theorem for $F = 4xz\vec{e} - y^2\vec{j} + yzk$ over the cube bounded by $x = 0,\ x = 1,\ y = 0,\ y = 1,\ z = 0,\ z = 1$. (9)

(b) A vector field is given by $F = (x^2 - y^2 + x)\vec{e} - (2xy + y)\vec{j}$ show that the field is irrotational and find its scalar potential. (6)

***

B.Tech. Degree III Semester Examination November 2013

IT/ME/EC/EB/EI 302 ELECTRICAL TECHNOLOGY

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Draw and explain the phasor diagram of practical transformer when its is connected to a capacitive load.

(b) Derive the emf equation of a DC generator.

(c) Explain critical field resistance and critical speed from open circuit characteristics of DC shunt generator.

(d) Explain cross magnetising and demagnetizing effect of armature reaction in DC generators.

(e) Discuss on pitch factor, pole pitch distribution factor and coil span with respect to an Alternator.

(f) A 6 pole induction motor is fed from 50Hz supply. If the frequency of rotor emf at full load is 2Hz find full load speed and slip.

(g) Derive the condition for maximum starting torque for 3 phase induction motor.

(h) Explain classification of substations.

PART B

(4 x 15 = 60)

II. (a) Derive the condition for maximum efficiency of single phase transformer. (3)

(b) A 15 KVA, 2300/230V, 50Hz single phase transformer gave the following test data (12)
OC – 2300V, 0.21A, 50IN
SC – 47V, 6A, 160W
(i) Find the equivalent circuit referred to high voltage side
(ii) Calculate full load voltage regulation at 0.8pf lagging when the load voltage is held at 230V.

OR

III. (a) Explain the working of auto transformer with diagram. (5)

(b) A 230/460V transformer has a primary resistance of 0.2Ω and a reactance of 0.5Ω and corresponding values for the secondary are 0.75Ω and 1.8Ω respectively. Find the secondary terminal voltge when supplying (i) 10A at 0.8 pf lagging (ii) 10A at .8pf leading. (10)

IV. (a) Explain power flow diagram of DC generator. (5)

(b) A short shunt compound generator supplies a load current of 100A at 250V. The generator has the following winding resistances shunt field 130Ω, armature 0.1Ω and series field 0.1Ω. Find the emf generated, if brush drop is 1V per brush. (10)

OR

V. (a) Discuss on various methods of speed control of DC series motors. (5)

(b) A 250V shunt motor runs at 100rpm at no load and taken 8A. The total armature and field resistances are 0.2Ω and 250Ω respectively. Calculate the speed when loaded and taking 50A. Assume flux to be constant. (10)

(P.T.O.)

VI. (a) Explain the working of synchronous motor at leading and lagging loads. (5)

(b) A 3 phase star connected 1000KVA, 11000V alternator has 52.5A. The AC resistance of winding per phase is 0.45Ω. The test results are given below: (10)
OC – field current = 12.5A, voltage between lines = 422V
SC – field current = 12.5A, Line current = 52.5A.
Determine the full load voltage regulation of alternator at (i) .8pf lag (ii) .8pf lead

OR

VII. (a) Explain the classification of 3 phase AC motors. (5)

(b) A 440V, 50HZ 3 phase induction motor draws an input power of 76KW from the mains. The rotor emf takes 120 complete cycles/minute. Its stator losses are 1KW and rotor current per phase is 62A. Calculate (i) rotor copper losses per phase (ii) torque developed (iii) rotor resistance per phase. (10)

VIII. (a) Explain the working of Thermal Power Plant with neat schematic diagram. (12)

(b) Explain different types of insulators in power system. (3)

OR

IX. (a) Explain different DC transmission schemes. (5)

(b) Explain economic load dispatch. (5)

(c) Discuss on various switch gears in power system. (5)

***

B.Tech. Degree III Semester Examination November 2013

EC/EI 303 NETWORK THEORY

(2006 Scheme)

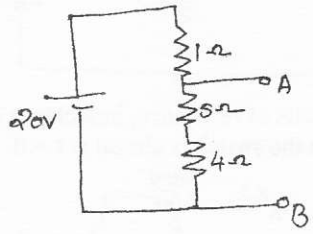
Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

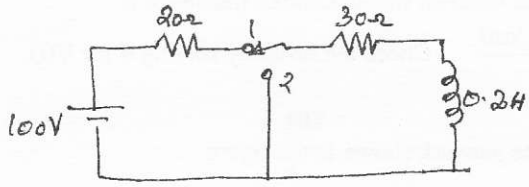
I. (a) Find the voltage between A and B in a voltage devider network shown in the figure.



(b) State and explain Thevenin's theorem and Noston's theorem.

(c) Explain hybrid parameters in terms of Z and Y parameters.

(d) For the circuit shown in the figure, find the current equation when the switch is changed from position 1 to position 2 at t = 0.



(e) Design a highpass filter having a cut off frequency of 1 KHz with a load resistance of 600 Ω.

(f) Explain Butter Worth and Chebyshev responses.

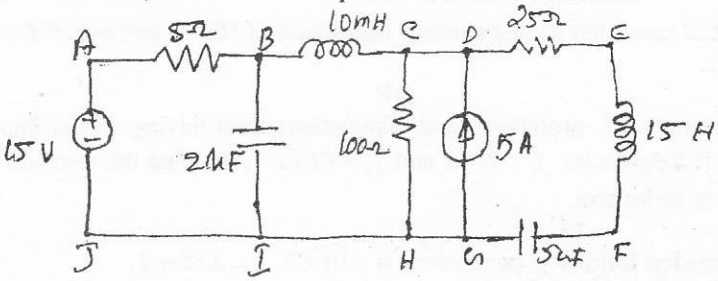
(g) A lossy cable has R = 3 Ω /m, L = 10 $\mu H / m$, C = 20PF/m and G = 0 operates at F = 1 GHz. Find the attenuation constant of the line.

(h) Write short notes on (i) VSWR (ii) Characteristic impedance.

PART B

(4 x 15 = 60)

II. (a) For the electrical network shown in the figure, draw its graph and write its incident matrix, tie set matrix, link currents, transformation equation and branch currents. (10)

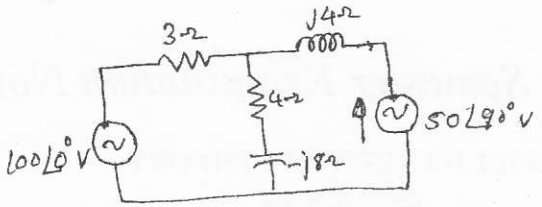


(b) Write the properties of a complete incidence matrix. (5)

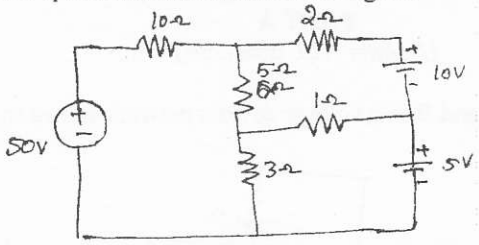
OR

(P.T.O)

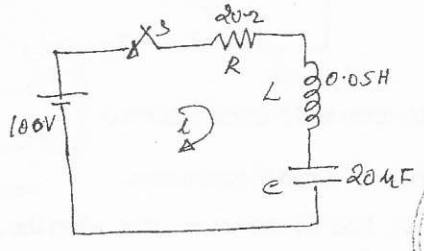
III. (a) Determine the value of source currents by loop analysis for the circuit shown and verify the results by using node analysis. (10)



(b) Determine the mesh current I_1 in the circuit shown in the figure. (5)



IV. (a) The circuit shown in the figure consists of resistance, inductance and capacitance in series with a 100V constant source. When the switch is closed at t = 0. Find the transient current. (9)

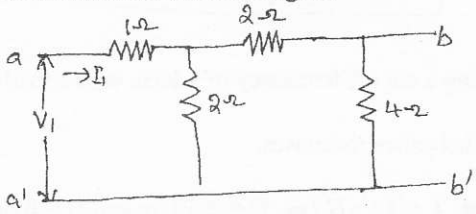


(b) Find the initial value of the function whose Laplace transform is (6)

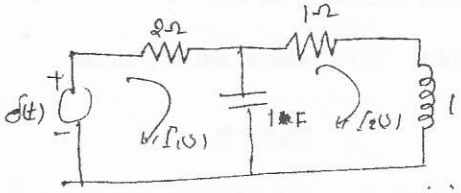
$V(S) = \dfrac{A(S+a)Sin\theta + bCos\theta}{(S+a)^2 + b^2}$. Check the result by solving it for V(t).

OR

V. (a) Find the h-parameter of the network shown in the figure. (8)



(b) In the circuit shown in the figure, find I_1 (S) and I_2(S). Assume zero initial conditions. (7)



VI. (a) Design a m derived $(T \& \pi)$ high pass filter with a cut off frequency of 10 KHz, design impedance of 500 Ω and m = 0.4. (7)

(b) Design K type band pass filter having a design impedance of 500 Ω and cut off frequencies 1 KHz & 10 KHz. (8)

OR

VII. Design $T \& \pi$ sections of prototype band eliminations filter having design impedance of 600 Ω and cut off frequencies $f_1 = 2Khz$ and $f_2 = 6Khz$. Also find the resonant frequency of the shunt arm or series arm. (15)

VIII. A transmission line has following parameters $R = 10.4\Omega$, $L = 3.66mH$, $e = 0.00835F$, $G = 0.08\mho$. Calculate Z_0, α, β and V_p at $\omega = 5000rad/\sec$. (15)

OR

IX. (a) A co-axial cable has the following parameters. $Z_0 = 25\lfloor 0\Omega$, $\ell = 20km$. If the power input is 1.5w and attenuation constant α is 2dB/km, find the output power of the cable provided, it is terminated by Z_0. (7)

(b) Derive the transformation line equation and hence obtain the expression for Z_0. (8)

***

B.Tech. Degree III Semester Examination November 2013

EC/EB/EI 304 DIGITAL ELECTRONICS

(*2006 Scheme*)

Time : 3 Hours

Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Convert the following codes in to binary, BCD and hexadecimal equivalents.

(i) $(347.524)_{10}$

(ii) $(6052.734)_8$

(b) Differentiate between combinational circuits and sequential circuits.

(c) Compare asynchronous counters and synchronous counters.

(d) Briefly explain a ring counter.

(e) Explain a full sbutractor circuit.

(f) Draw the circuit of a monostable multivibrator using gates and explain its working.

(g) Compare TTL and CMOS.

(h) Draw and explain the transfer characteristics of a TTL inverter.

PART B

$(4 \times 15 = 60)$

II. (a) Explain Hamming code. Generate the Hamming code for the data 1001 with even parity system. (7)

(b) Explain the universal property of NAND and NOR gates. (8)

OR

III. (a) Simplify the function $F_{ABCD} = \sum(0,1,5,6,8,12,14), \phi(2, 4, 9, 10, 15)$ using Karnaugh-map and implement using NAND gates only. (10)

(b) Draw and explain the implementation of 4 : 1 multiplexer using basic gates. (5)

IV. (a) Draw and explain a master slave JK flip flop using NAND gates. (6)

(b) Explain a synchronous decade counter with necessary diagrams. (9)

OR

V. (a) Explain the working of a 4-bit parallel in serial out shift register. (6)

(b) Design a synchronous sequence generator that generates 0, 1, 2, 4, 8, 1,..... (9)

VI. (a) Write the truth table of a full adder. Draw the implementation of a full adder using two half adders. (6)

(b) Draw and explain the implementation of a 4 bit × 3 bit binary multiplier. (9)

OR

VII. (a) Explain a carry look ahead adder with diagrams. (8)

(b) Briefly discuss the organization of RAM. (7)

VIII. (a) Draw the circuit of 2-input TTL NAND gate and explain its working. (10)

(b) Explain the interfacing of CMOS to TTL. (5)

OR

IX. Write notes on: (15)

(i) Propagation delay

(ii) Sinking current

(iii) Sourcing current

(iv) Noise Margin

(v) Figure of merit

***

BTS – III – 11.13 – 1212

B.Tech. Degree III Semester Examination November 2013

EC/EI 305 SOLID STATE ELECTRONICS

(2006 Scheme)

Time : 3 Hours

Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Describe the temperature dependence of majority carrier concentration in extrinsic semiconductor.

(b) A Ge sample is doped with 10^{17} Boron atoms per cm^3. Determine the carrier concentrations and Fermi level position at room temperature. n_i for Ge = 2.5×10^{13} cm^{-3} at room temperature.

(c) Explain the capacitance of p – n junction.

(d) Explain the operation principle of tunnel diode.

(e) Explain the three consequences of basewidth modulation.

(f) Describe the practical doping profile of BJT.

(g) What are the advantages of MOSFET over JFET?

(h) Explain the operation of a CMOS inverter with suitable diagrams.

PART B

$(4 \times 15 = 60)$

II. (a) Define Fermi-level. What is the effect of temperature on the Fermi Dirac distribution? (10)

(b) Show that how the majority carrier concentration can be measured using Hall effect. (5)

OR

III. Derive the expressions for drift and diffusion components of current density and obtain the Einstein relation. (15)

IV. Derive the diode equation. (15)

OR

V. (a) Derive the expression for depletion layer width of P – N junction. (8)

(b) Discuss the different types of breakdown occurring in diodes. (7)

VI. Derive and explain Ebers-Moll equations. Also illustrate the coupled diode property of this with equivalent circuit. (15)

OR

VII. (a) Discuss the various components of current in a BJT with a suitable diagram. Explain amplification in BJTs using emitter injection efficiency and base transport factor. (10)

(b) Explain the working of UJT with its V – I characteristics. (5)

VIII. Explain the construction, principle of operation and characteristics of the 'n' channel JFET with suitable diagrams. (15)

OR

IX. What are depletion and enhancement MOSFETs? Draw their constructional details and characteristics. Explain the working of P-channel MOSFET. (15)

***

B.Tech. Degree III Semester Examination November 2013

EC/EI 306 ELECTRONIC CIRCUITS I

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Show that a full-wave rectifier is twice as efficient as a half wave rectifier.

(b) What is the principle of voltage doubling and hence multiplication?

(c) What is a Darlington Transistor? What are its salient features?

(d) "The cut-off frequencies of single stage amplifiers are influenced by R-C combinations" – justify the statement.

(e) Explain how the transconductance of a JFET varies with drain current and gate voltage.

(f) Compare JFET with BJT.

(g) Describe the operation of biased clipper and combination clipper.

(h) What is the multivibrators? On what basis are multivibrators classified.

PART B

(4 x 15 = 60)

II. Explain various types of filters used in power supplies. Derive an expression for the ripple factor in a full-wave rectifier using inductive filter. (15)

OR

III. Explain the principles of obtaining regulated power supply. Define line regulation and load regulation in a voltage regulator. (15)

IV. Draw the AC equivalent circuit of a CE amplifier with unbypassed emitter resistor using h-parameter model and remodel and derive the equations for input impedance, output impedance, voltage gain and current gain. (15)

OR

V. Derive the expression for CE short circuit current gain as a function of frequency and hence define the 'α' and 'β' cut-off frequencies. (15)

VI. Draw the equivalent circuit of Common-Drain amplifier at high frequencies and derive expression for voltage gain, input admittance and output admittance. (15)

OR

VII. Derive the equation for the overall voltage gain of a multistage amplifier in terms of the individual voltage gains. (15)

VIII. With a neat sketch, explain the working of an astable multivibrater. On what factors does the frequency of the output waves depend? List the applications of astable multivibrator. (15)

OR

IX. (a) Derive the equivalent circuit of UJT and explain its operation with the help of emitter characteristics. (7)

(b) Explain the –VI characteristics of a UJT. (8)

***