

2014
BT-321
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M (Printed Pages 4)

(21214) Roll No.

B.Tech.-III Sem.

TU-353

B.Tech. Examination, Dec. 2014

E.I. Branch

Polymer Science & Technology

BT-321 (N)

Time : Three Hours / [Maximum Marks : 100]

Note: Attempt any **five** questions. **All** questions carry equal marks.

1. What are Fibre-reinforced plastics? Give a method for the preparation of such a plastic. Describe its properties and applications.
20
2. (a) What do you mean by the term crystallinity in polymers? Discuss the effect of crystallinity on the properties of polymers.
10

P.T.O.

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- (b) Describe the solution process of polymers. Explain the effect of polymer properties on solution process. 10
3. Mention and discuss important methods for characterization of polymers. 20
4. Differentiate between addition and condensation polymerization processes. Mention the three basic steps involved in addition polymerization. Are these steps common in free radical anionic and cationic addition polymerization? Write clearly the initiation steps for the three types of addition polymerization process. 20
5. Discuss the applications of polymers in the following sectors : $5 \times 4 = 20$
- (i) Agriculture
 - (ii) Automotive
 - (iii) Space
 - (iv) Sports

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6. Distinguish between the following pair of terms: $5 \times 4 = 20$
- (a) Alternate and Random copolymers
 - (b) Anionic and Cationic polymers
 - (c) Nylon 6,6 and Nylon 6,10
 - (d) Thermoplastics and Thermo set polymers
7. (a) What is coordination polymerization? Discuss the mono metallic mechanism of such polymerization. 10
- (b) Write the preparation, properties and uses of
- (i) Styrene butadiene rubber and
 - (ii) Urea- formaldehyde resins 10
8. (a) How do the kinetics of polymerization differ in the bulk and suspension of polymerization method? 10

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- (b) Explain the number-average and weight-average molecular mass. 10
9. (a) Discuss the mechanism of cationic chain growth polymerization process. 10
- (b) What are composite materials? Discuss some important types of fibre reinforced composites. 10
10. Write an brief essay on silicones. 20

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Roll No.

B.Tech. III Sem.

TU-356

B.Tech. Examination, Dec. 2014

EC, EI, ME Branches

Industrial Psychology

[BT-324(N)]

Time : Two Hours]

[Maximum Marks : 50

Note : Attempt any **five** questions. **All** questions
carry equal marks.

1. What are the objectives of industrial psychology? Explain the historical foundation of industrial psychology. 10
2. Why psychologists examine Individual differences? How knowing individual differences helps in predicting behaviour? 10

P.T.O.

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3. Describe the different types of intelligence tests useful in assessing human mental abilities. 10
 4. "Personality inventories measure more deeper aspects of personality than rating scales." Justify the statement. 10
 5. What is meant by organisational culture? How can healthy organisational culture improve the performance of employees? 10
 6. Explain a good leadership. How can it raise the group morale of Industrial employees. 10
 7. Why do Industrial engineering strongly emphasises understanding of workers and their needs in order to raise and improve production? Elaborate. 10

- 19
8. What are the negative effects of stress on workers? How can a psychologist play the role in maintaining individual well being. 10
 9. What are the necessary steps in selection procedure? Describe the major techniques used for employee selection. 10
 10. Why employee counselling service is needed in Industry? What is the role of a counsellor in Industry? 10

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Roll No.

B.Tech. III Sem.

TU-61

B.Tech. Examination, Dec. 2014

E.C. & E.I. Branch

Industrial Psychology

BT-324

Time : Two Hours]

[Maximum Marks : 50

Note : Attempt any **five** questions. **All** question carry equal marks.

1. Describe the scope of industrial psychology.
Discuss the merit and demerits of Hawthorne experiments. 10
2. Evaluate various theories of motivation. In your opinion which theory of motivation is the best. 10
3. Define stress. Discuss various techniques of stress management. 10

P.T.O.

4. Discuss merits and demerits of various styles of leadership. 10
5. What is meant by work environment? Describe various characteristics of an effective work environment.
6. Define fatigue. Describe various types of fatigue. 10
7. Describe various types of test used in selecting professionals in a work environment. 10
8. Define reliability. Discuss various methods of reliability. 10
9. Define accident. Describe various steps to prevent accident in an industrial situation. 10
10. What is meant by performance management? Discuss various methods of performance management. 10

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Roll No.

B.Tech. III Sem.

TU-62

B.Tech. Examination, Dec. 2014

E.C. & E.I. Branches

Science Elective (NANO SCIENCE)

BT-325

Time : Three Hours / [Maximum Marks : 100]

Note: Attempt any **five** questions.

1. Define the term nanotechnology and give some application of nanotechnology. 20
2. (a) Discuss the theory of fermi surface. 10
(b) Give the concept of effective mass of electron. 10
3. Draw the neat diagram of a device used to form clusters of metal atom. And also explain electronic magnetic numbers. 20

P.T.O.

4. Explain the concept of photofragmentation and also explain coulmbic explosion for semi-conducting nanoparticles. 20
5. Explain the technical concept of chemical vapour deposition (CVD) method with neat diagram. 20
6. Explain the principle and working of scanning tunnelling Microscopy. 20
7. What is the sputting? Explain the thermal evaporation technique. 20
8. State and explain the synthesis of multi walled carbon nanotubes. 20
9. Derive Schrodinger wave equation and explain on it's basis the motion of a free particle in one dimentional box. 20
10. Write short notes on any **two**: 2×10
 - (i) Infra red and Raman spectroscopy.
 - (ii) Nano robots
 - (iii) Nano-Biometrics.

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Roll No.

B.Tech. III Sem.

TU-358

B.Tech. Examination, Dec - 2014

EC, EI, CH Branches

Human Values & Professional Ethics

BT-326(N)

Time : Two Hours]

[Maximum Marks : 50

Note: Attempt any **five** questions out of the following.

1. Critically examine our state today in terms of fulfilment of relationships and physical facilities. What has gone wrong according to you? What is the solution?
2. "I will learn and improve only if I am unhappy. If I become happy, my learning will stop." Explore the validity of this view point.

10

P.T.O.

3. What do you mean by the statement "Human being is more than just the body"? Distinguish between the needs of the self and the needs of the body. 10
4. "The problem today is that the desires, thoughts and expectations are largely set by pre-conditionings or sensations" Examine this statement. 10
5. Indicate a few feasible steps to promote harmony in the society and co-existence with nature. 10
6. What exactly is implied by the term-nature? What are the four orders in nature? Explain. 10
7. Where is the scope of development in nature? How have we come to wrongly place our developmental programs? 10

8. What is ethical human conduct? Explain it in terms of values, policies and character. 10
9. What do you mean by universal human order? What are its implications on the different dimensions of a society? 10
10. What do you mean by 'Profession'? Why is it required to acquire ethical competence in profession? 10

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Roll No.

B.Tech. III Sem.

TU-67

B.Tech. Examination, Dec. 2014

E.C./E.I.

Human Values & Professional Ethics

BT-326

Time : Two Hours]

[Maximum Marks : 50

Note: Attempt **all** questions. Each question carries equal marks.

1. What are self exploration and its purpose? Illustrate the process of self exploration with a neat diagram?

OR

What are the basic requirements to ensure happiness and prosperity for human beings? Explain the condition of SVDD, SSDD and SSSS.

2. 'Human body is a self organized unit' Comment? What is your attitude towards the Body and its consequences?

P.T.O.

OR

Explain the characteristics and activities of 'I'. Explain with the help of an example how you will ensure harmony in 'I'.

3. Explain the feelings of 'gratitude', 'reverence', 'affection' and 'trust'?

OR

What is meant by comprehensive human goal? Mention its features?

4. What are the four orders in nature? Briefly explain them.

OR

Explain the term co-existence? How are units self-organized in space?

5. What do you understand by holistic technology? Also elaborate the criteria of its evaluation?

OR

Write a note on 'competence in professional ethics'.

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B.Tech. III Sem.

TU-359

B.Tech. Examination, Dec. 2014

EC, EI Branches

Fundamentals of Electronics Devices

BT-301(N)

Time : Three Hours } [Maximum Marks : 100

Note: Attempt any **five** questions. **All** question carry equal marks.

1. (a) What do you mean by Mobility of carrier? How does it depend on temperature and doping Concentration?
- (b) Explain the basic crystal growth techniques & also explain Elemental and compound Semiconductor.

P.T.O.

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2. (a) What is a photodetector? Describe the working of solar cell. What are the applications of these devices?
 - (b) Describe the characteristics and application of SCR and P-N-P-N diode.
 3. Explain the following with proper Diagram.
 - (a) Photo Conductivity
 - (b) Luminescence
 4. (a) What do you mean by zener diode? Explain how zener diode maintains constant Voltage across the load.
 - (b) What do you mean by reverse bias break down? Calculate the thermal equilibrium electron and hole concentration in a compensated p-type silicon semiconductor at 300°K in which $N_A = 10^{16} \text{ cm}^{-3}$, $N_D = 3 \times 10^{15} \text{ cm}^{-3}$ and $n_i = 1.6 \times 10^{10} \text{ cm}^{-3}$.

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5. What is a MOSFET? How many types of MOSFETs are there? Point out the basic difference between the FET and BJT?
 6. Explain the working Principle of IMPATT Diode. How does the electric field and hole construction varies with the input a-c Signal?
 7. Differentiate between the Direct Semiconductor and Indirect Semiconductor with relevant band diagrams.
 8. Explain the tunnel diode in detail. What are its applications?
 9. Explain the following with Proper diagram:
 - (a) Optical absorption
 - (b) Carrier life time
 10. (a) Explain the working principle of MESFET & How it is different from MISFET.
 - (b) What do you mean by excess carriers? How they are created?

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Roll No.

B.Tech. III Sem.

TU-63

B.Tech. Examination, Dec. 2014

E.C. & E.I. Branches

Fundamental of Electronic Devices

BT-301

Time : Three Hours]

[Maximum Marks : 100

Note: Attempt any **Five** of the following.

1. (a) Explain terms 'space lattice', basis and unit cell as applied to crystal structure.

10

- (b) What is a cubic lattice? What are the different space lattices in the cubic system? How many lattices points per unit cell are there in each of these lattices.

10

P.T.O.

2. (a) Find the packing fraction of simple cubic structure. 10
 (b) Find the miller indices of a set of parallel planes which makes intercepts in the ratio of $4a$, $3b$ on the x and y axis and are parallel to z axis. a , b , c are primitive vectors of the lattices. 10
3. (a) What do you mean by optical absorption? Define absorption coefficients. 10
 (b) What is luminescence? Define photoluminescence and Electroluminescence. 10
4. (a) Explain the zener and avalanche thermal break down mechanism. What will be their thermal coefficients. 10
 (b) What do you mean by forward and reverse biased junction? Give the qualitative description of current flow at the junction. 10

5. (a) Explain the working of a P_NP transistor with the help of its energy band diagram. 10
 (b) Explain the construction, working and characteristics of MOSFET. 10
6. (a) Compare N-channel MOSFET with P-channel MOSFET. 10
 (b) What is a photo diode? Explain its construction and working? 10
7. (a) Describe step index fiber and graded index fiber. 10
 (b) What is LED? Give its principle of working, construction and its advantages and disadvantages. 10
8. (a) What is a Tunnel diode? Explain the essential differences between a semiconductor junction diode and a Tunnel diode. 10

- (b) Give the constructional features of a Gunn diode along with neat sketch. 10
9. (a) What is p-n-p-n diode? Also explain its V-I characteristics. 10
- (b) Explain the mechanism of operation of SCR. 10
10. Explain any **four** of the following: 20
- (a) IGBT
 - (b) Optical fiber
 - (c) MISFET
 - (d) Zener diode
 - (e) Drift current

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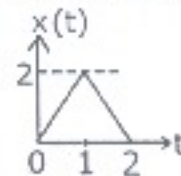
Roll No.

B.Tech. III Sem.

TU-360**B.Tech. Examination, Dec - 2014****EC, EI Branches****Signals & Systems****BT-302(N)***Time : Three Hours]**[Maximum Marks : 100*

Note: Attempt any **five** questions. **All** questions carry equal marks.

1. (a) Define unit impulse function and also state at least three properties of it. 20
- (b) Draw even and odd parts of the signal depicted in figure given below :



- (c) Prove that a signal cannot be both energy and power signal.

P.T.O.

2. (a) Explain the following : 20

- (i) Exponential signal
- (ii) Signum function
- (iii) Sine function

(b) Let $X_1(t)$ and $X_2(t)$ be periodic signals with fundamental period T_1 and T_2 respectively. Under what condition is the sum $X(t) = X_1(t) + X_2(t)$ periodic and what is the fundamental period of $X(t)$ if it is periodic.

3. (a) The signal $X(t)$ has the Laplace transform $X(S) = (S+2)/(S^2+4S+5)$ 20

Find the Laplace transform of the following signal $y(t) = X(2t-1) u(2t-1)$

(b) Write at least three properties of ROC for z-transform.

(c) Find the inverse Laplace of

$$G(S) = (10S^2 e^{-S})/(S+1)(S+3)$$

4. (a) Find the inverse z of 20

$$X(z) = \frac{(z^3 - z^2 + z)}{(z - 0.5)(z - 2)(z - 3)}; 1 < |z| < 2$$

(b) Determine the signal $X(n)$ whose Z-transform is given by

$$X(z) = \log(1 - az^{-1}); |z| > |a|$$

5. (a) Differentiate CTFT and DTFT. 20

(b) Determine the CTFT for the rectangular pulse of period T , width τ a amplitude A .

(c) Consider the rectangular pulse, determine its DTFT for $N_1 = 2$.

$$X(n) = \begin{cases} 1 & |n| \leq N_1 \\ 0 & |n| > N_1 \end{cases}$$

6. (a) State and prove Parseval's theorem for Continuous Time Fourier Transform. 20

(b) Calculate the Fourier Transform of :

(i) $S[n-1] + S[n+1]$

(ii) $S[n+2] - S[n-2]$

7. (a) Write the relation between correlation and convolution. 20

(b) The input-output relation for a CTS is given by

(i) $y(t) = x(2t)$

(ii) $y(t) = x(t/2)$

Find whether the system is : Linear or non-linear, Time invariant or time variant, Causal or non-causal.

(c) Find the energy spectral density of the signal $x(t) = e^{-t} u(t)$

8. (a) Compute and plot $y[n] = x[n] * h[n]$, where 20

$$x[n] = \begin{cases} 1, & 3 < n < 8 \\ 0, & \text{otherwise} \end{cases}$$

$$h[n] = \begin{cases} 1, & 4 < n < 15 \\ 0, & \text{otherwise} \end{cases}$$

(b) State and prove convolution theorem in continuous time domain.

9. Determine the impulse response of $h[n]$ for the system described by the second order difference equation. 20

$$y[n] - 4y[n-1] + 4y[n-2] = x[n] - x[n-1]$$

$$\text{when } y[-1] = y[-2] = 0$$

10 Realize the system given as 20

$$y[n] - \frac{5}{6}y[n-1] + \frac{1}{6}y[n-2] = x[n] + 2x[n-1]$$

using z-transform with minimum number of delay unit, assume initial condition is zero.

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Roll No.

B.Tech. III Sem.

TU-65

B.Tech. Examination, Dec. 2014

EC, EI Branches

Electro-Magnetic Field Theory

BT-303

Time : Three Hours]

[Maximum Marks : 100

Note : (i) Solve any **five** questions.

(ii) Use of calculator is permitted.

1. (a) Show that the vector fields

$$\vec{A} = \hat{a}_r \frac{\sin 2\theta}{r^2} + 2 \hat{a}_\theta \frac{\sin \theta}{r^2}$$

and $\vec{B} = r \cos \hat{a}_r + r \hat{a}_\theta$ and everywhere parallel to each other.

- (b) Explain the significance of Del (∇) operator. 5 + 5

2. Explain coulomb's law and its importance, relate force with electric field intensity. 10

P.T.O.

3. (a) Derive the Marwells first and second equation in integral and differential forms.

(b) A sphere of radius 4 cm is having a volume charge density of e_v given by $e_v = \cos^2\theta$. Find the total charge Q contained in a sphere. 5+5

4. (a) State and explain Gauss's Law.

(b) Derive an expression on the potential at a point outside a hollow sphere having a uniform charge density. 4+6

5. (a) Define the following terms with suitable examples.

(i) The dielectric material.

(ii) Polarization

(iii) The isotropic medium

(iv) Linear Medium 10

6. State and explain Ampere's circuital law in integral form. 10

7. Define and explain the term magnetic force, magnetic flux density and magnetic permeability and the units in which each of these quantities measured in MKS unit. 10

8. Define the terms and obtain expression for Voltage wave standing wave ratio, reflection coefficient and reflection percentage on a loss free transmission line.

9. State and derive magnetic boundary conditions calculate the self inductance per unit length of infinite long solenoid. 10

10. A 30 m long transmission line with $z_0 = 50\Omega$ operating at 2MHz is terminated with a load of $Z_L = 60 + j 40 \Omega$. If the velocity of wave $v = 6c$ on the line find the reflection coeff. Γ , standing wave ratio, and input impedance.

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B.Tech.-III Sem.

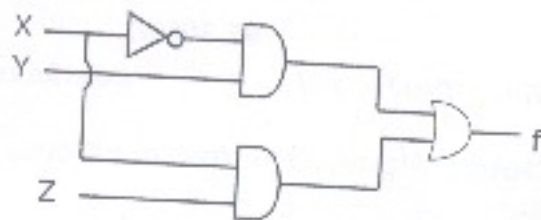
TU-361**B. Tech. Examination, Dec. 2014****EC, EI Branches****Switching Theory & Logic Design****BT-303(N)***Time : Two Hours /**[Maximum Marks : 50]*

Note : Attempt any **five** questions. Each question carry equal marks.

1. (a) Design a BCD to Excess-3 code Converter. 5
- (b) Simplify the following Boolean function by using the Tabulation method
 $F = \sum (0, 1, 2, 8, 10, 11, 14, 15)$. Implement the circuit using NAND gate. 5

P.T.O.

2. (a) Prove De Morgan's theorems. 5
 (b) Compute the Switching function represented by the gate network of the following figure. Also compute the truth table of the network 5



3. (a) Design a full subtractor using only NAND gates. 5
 (b) Implement the following function using a multiplexer : 5
 $F(A,B,C) = \Sigma (1,3,5,6)$
 4. (a) Convert a 'D' flip flop to 'T' flip flop. 5

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- (b) What is meant by Race around condition? How it is overcome? 5
 5. Obtain a static hazard free asynchronous circuit for the following switching function 10
 $\Sigma (0,2,4,5,8,10,14)$
 6. Write a note on any 4 flip flops with its function and truth table. 10
 7. Explain any counter design with J-K flip flop. 10
 8. Describe the parallel in serial out shift Register and parallel in parallel out shift register with neat logic diagram. 10
 9. How many 16k XIRAMs are required to achieve a memory with word capacity of 16K and a word length of eight bits. 10

TU-361\200\3

P.T.O.

10. (i) Convert the Gray Code. 110101 to binary form. 2
- (ii) Express the function $Y = A + \bar{B}C$ in canonical Pos form. 2
- (iii) Simplify the expression
 $AB + \bar{A}C + A\bar{B}C(AB + C) = 1$ 2
- (iv) Explain the term "universal gate". 2
- (v) Explain the difference between static and dynamic memories. 2

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Roll No.

B.Tech.-III Sem.

TU-66**B.Tech. Examination, Dec - 2014****E.C. / E.I.****Fundamental of Network Analysis &
Synthesis****BT-304***Time : Three Hours]**[Maximum Marks : 100***Note:** Attempt any **five** questions.

1. (a) For a two port network determine the conditions of reciprocity for z , y , T Parameters. 10
- (b) An exponential wave form is given by $V_o(f) = V_i(t)e^{-bt}$. Sketch the double derivative wave form of this function. 10

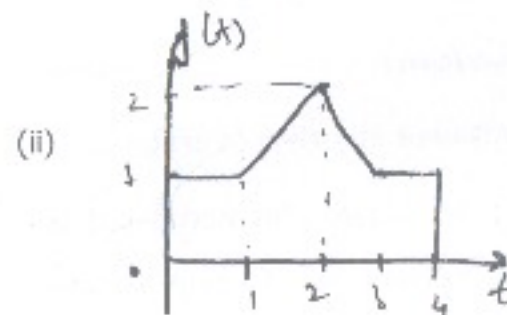
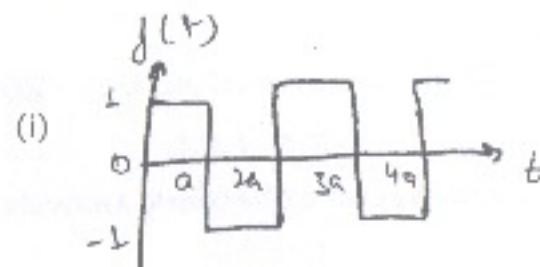
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2. (a) State and Prove the Norton's Theorem.

10

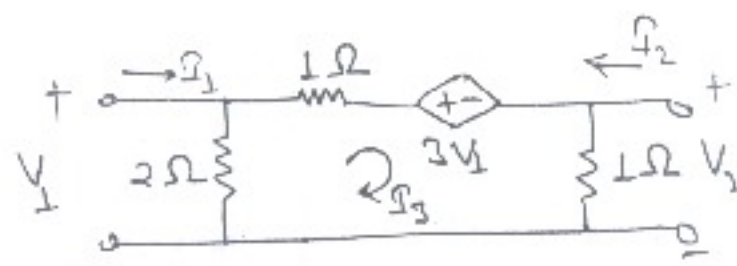
(b) Find the laplace of the following function.

10



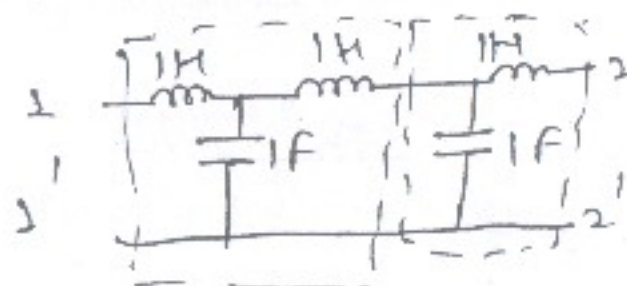
3. (a) Find the y and z parameters for the network give below :

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(b) Define poles and zeroes and also write the properties of transfer function. 10

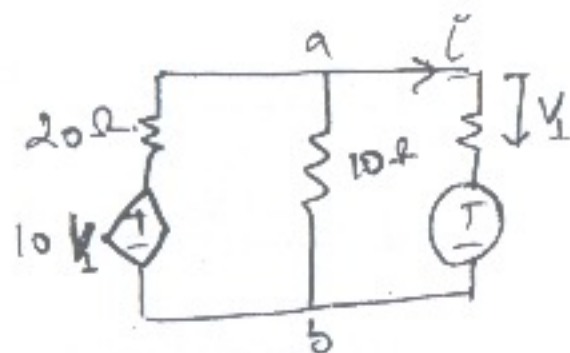
4. (a) Determine the transmission parameters of the network given below, using the concept of interconnection of two-port networks N_1 & N_2 in cascade 10



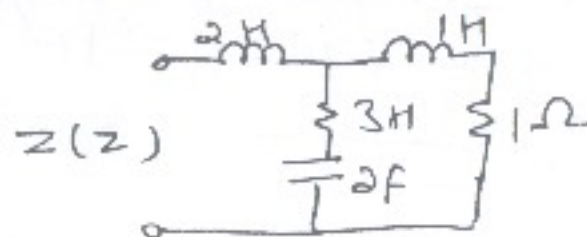
(b) Find the current across ab terminals with the helps of Norton's theorem 10

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P.T.O.



5. (a) What are the necessary conditions of stability of a system? 8
- (b) Determine the transfer function $z(s)$ of given network. Find out the poles & zeros of $z(s)$ & plot them, on s plane



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6. Find the RL Representation of :
- (a) Foster I & II forms
- (b) Cower I & II forms of given impedance function. 20

$$Z(S) = \frac{S^3 - S^2 + 3S + 4}{S^2 + 6S + 2}$$

7. (a) In one port synthesis write the general form & properties of RL impedance function. 10
- (b) Test for Positive Real functions.

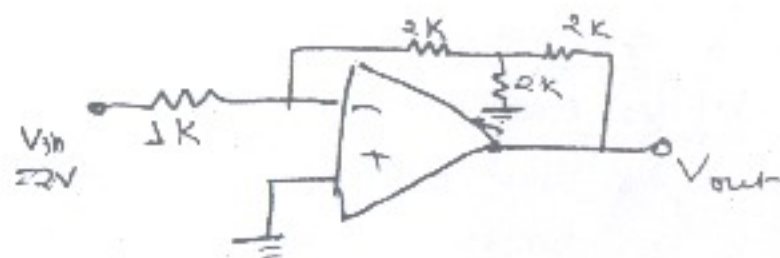
(i) $F(S) = \frac{2S^2 + 2S + 1}{S^3 + 2S^2 + S + 2}$

(ii) $F(S) = \frac{(S+2)(S-4)}{(S+1)(S+3)}$

8. (a) Explain the working of OPAMP as an integrator. 10
- (b) for the circuit shown in given fig. Find the output voltage V_{out} . 10

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P.T.O.



- (b) Define unit step function, unit ramp function and unit impulse function. 10

9. (a) Write the characteristics of an ideal OPAMP. 8

- (b) Explain the working of (V-I) & (I-V) converters using OPAMP. 12

10. (a) The characteristics equation of a control system is given by

$$S^4 + 12S^3 + 69S^2 + 198S + (200 + K) = 0$$

By applying the Routh criterion, discuss the stability of the system as a function of K. Determine the values of K which will cause sustained oscillations in the system.

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B.Tech.-III Sem.

TU-362

B.Tech. Examination, Dec. 2014

EC, EI Branches

Network Analysis & Synthesis

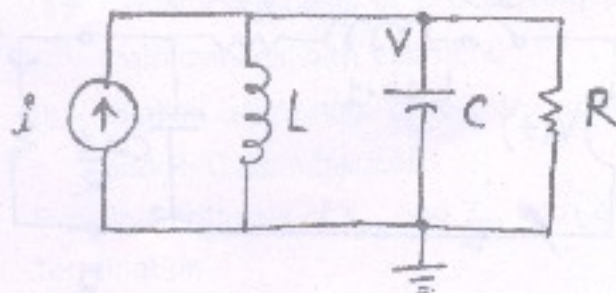
BT-304(N)

Time : Three Hours]

[Maximum Marks : 100

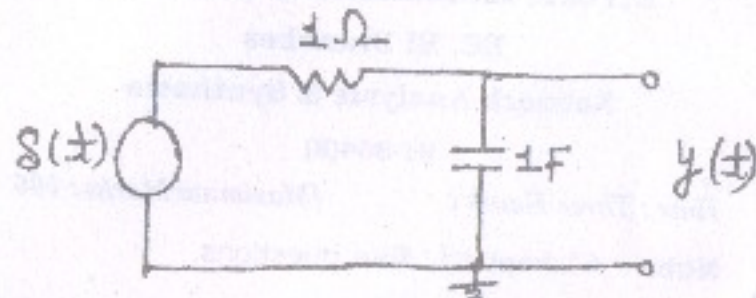
Note : Attempt any **five** questions.

1. For the network shown, write the node equation in terms of : 20
 - (a) differential equations and
 - (b) complex - frequency form

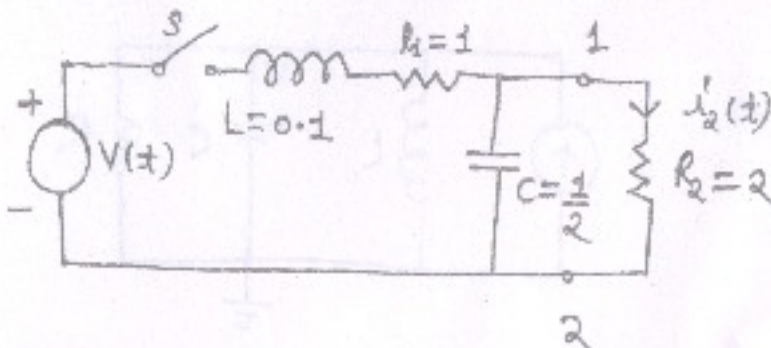


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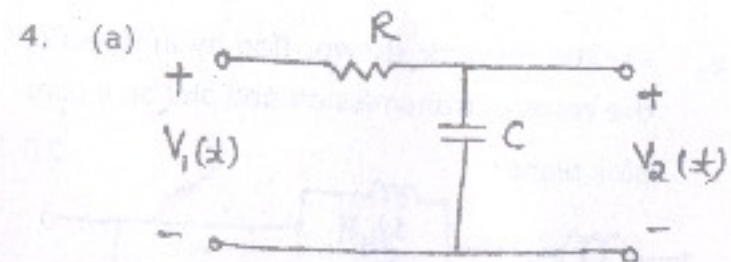
2. (a) Explain the unit Impulse function with proper mathematical expressions and associated waveforms. 10
 (b) Find $y(t)$ for the network shown in Figure below : 10



3. In the network shown in Figure that is given below, the switch closes at $t=0$. It is given that $V(t) = 0.1 e^{-7t}$ and all initial currents and voltages are zero. Find the current $i_2(t)$ by Norton's theorem. 20



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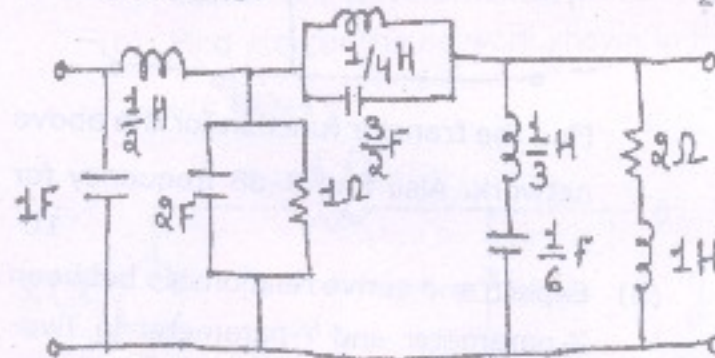
Find the transfer function for the above network. Also find 3-dB frequency for it. 10

- (b) Explain and derive relationship between Z-parameter and Y-parameter in Two-PORT NETWORK. 10
 5. (a) Investigate that the given polynomial is Hurwitz or not. 10
 $F(s) = s^4 + s^3 + 5s^2 + 3s + 4$
 (b) Explain positive real functions in detail. 10
 6. (a) Explain synthesis of L-C Driving point Immittances with example. 10
 (b) Explain properties of R-L Impedances and R-C Admittances. 10
 7. Explain Synthesis of Y_{21} and Z_{21} with a $1-\Omega$ Termination. 20

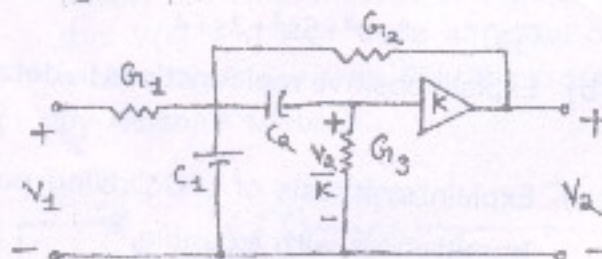
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8. For the network shown, find by inspection the zeros of transmission and plot on a complex plane- 20



9. Find $V_2(s)/V_1(s)$ for the network shown in Figure. 20



10. Represent the given transfer function in block diagram. 20

$$H(s) = \frac{Y(s)}{V(s)} = \frac{b_1s + b_0}{s^2 + a_1s + a_0}$$

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