

B.TECH.
THEORY EXAMINATION (SEM-II) 2016-17
ENGINEERING MATHEMATICS - II

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Explain the following: 10 x 2 = 20

- (a) Show that the differential equation $y dx - 2x dy = 0$ represents a family of parabolas.
- (b) Classify the partial differential equation

$$(1 - x^2) \frac{\partial^2 z}{\partial x^2} - 2xy \frac{\partial^2 z}{\partial y \partial x} + (1 - y^2) \frac{\partial^2 z}{\partial y^2} = 2z$$

- (c) Find the particular integral of $(D - a)^2 y = e^{ax} f''(x)$.
- (d) Write the Dirichlet's conditions for Fourier series.
- (e) Prove that $J'_0(x) = -J_1(x)$.
- (f) Prove that $L [e^{at} f(t)] = F(s - a)$
- (g) Find the Laplace transform of $f(t) = \frac{\sin at}{t}$.
- (h) Write one and two dimensional wave equations.
- (i) Find the constant term when $f(x) = |x|$ is expanded in Fourier series in the interval $(-2, 2)$.
- (j) Write the generating function for Legendre polynomial $P_n(x)$.



SECTION - B

2. Attempt any five of the following questions: 5 x 10 = 50

- (a) Solve the differential equation $(D^2 + 2D + 2)y = e^{-x} \sec^3 x$, where $D = \frac{d}{dx}$.
- (b) Prove that $(n + 1)P_{n+1}(x) = (2n + 1)xP_n(x) - nP_{n-1}(x)$, where $P_n(x)$ is the Legendre's function.
- (c) Find the series solution of the differential equation

$$2x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - (x + 1)y = 0.$$

- (d) Using Laplace transform, solve the differential equation $\frac{d^2 y}{dt^2} + 9y = \cos 2t$; $y(0) = 1$, $y\left(\frac{\pi}{2}\right) = -1$.
- (e) Obtain the Fourier series of the function,

$$f(t) = t, \quad -\pi < t < 0$$

$$= -t, \quad 0 < t < \pi.$$

Hence, deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$

- (f) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ under the conditions $u(0, y) = 0$, $u(l, y) = 0$, $u(x, 0) = 0$ and $u(x, a) = \sin \frac{n\pi x}{l}$.
- (g) Solve the partial differential equation: $(D^3 - 4D^2 D' + 5D D'^2 - 2D'^3)z = e^{y+2x} + \sqrt{y+x}$
- (h) Using convolution theorem find $L^{-1} \left[\frac{1}{(s+1)(s^2+1)} \right]$

Attempt any two of the following questions:

3. (a) Solve the differential equation $(D^2 - 2D + 1)y = e^x \sin x$
 (b) Solve the equation by Laplace transform method:

$$\frac{dy}{dt} + 2y + \int_0^t y dt = \sin t, \quad y(0) = 1.$$

 (c) Solve the partial differential equation

$$(y^2 + z^2)p - xyq + zx = 0, \text{ where } p = \frac{\partial z}{\partial x} \text{ \& } q = \frac{\partial z}{\partial y}.$$
4. (a) Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$.
 (b) Express $f(x) = 4x^3 - 2x^2 - 3x + 8$ in terms of Legendre's polynomial.
 (c) Expand $f(x) = 2x - 1$ as a cosine series in $0 < x < 2$.
5. (a) Show that $J_3(x) = \left(\frac{8}{x^2} - 1\right)J_1(x) - \frac{4}{x}J_0(x)$.
 (b) Solve the $2 \frac{\partial z}{\partial x} + 3 \frac{\partial z}{\partial y} + 5z = 0; z(0, y) = 2e^{-y}$ by the method of separation of variables.
 (c) A tightly stretched string with fixed end $x = 0$ and $x = l$ is initially in a position given by $y = a \sin \frac{\pi x}{l}$. If it is released from rest from this position, find the displacement $y(x, t)$.

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Time : 3

Note : B

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B. TECH.

THEORY EXAMINATION (SEM-II) 2016-17

ENGINEERING PHYSICS - II

Time : 3 Hours

Max. Marks : 70

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt all parts of the following question:

7 x 2 = 14

- What is unit cell?
- What is Compton Effect?
- What is polarization in dielectrics?
- Define magnetic susceptibility.
- What is displacement current?
- What is effective mass?
- What do you mean by Meissner effect?

SECTION - B

2. Attempt any three parts of the following question:

3 x 7 = 21

- Describe Bragg's X-ray spectrometer. Explain how it is used to study structure of the crystals.
- Describe Langevin's theory of dia-magnetism. Show that the magnetic susceptibility is negative and independent of temperature for diamagnetic materials.
- Write down Maxwell's equations in free space and show that E, H and direction of propagation form a set of orthogonal vectors.
- Discuss the formation of bands in solids. Differentiate semiconductors, conductors and insulators on the basis of band gap.
- What are Bucky balls? Discuss their preparation techniques, properties and applications.

SECTION - C

Attempt all of the following questions:

5 x 7 = 35

3. Attempt any two parts.

- Describe the crystal structure of sodium chloride (NaCl).
- What are Miller indices of a given plane? How are they obtained?
- The lattice constant for a cubic lattice is 'a'. Deduce the spacing between (101) and (112) planes.

4. Attempt any two parts.

- Discuss the effects of alternating electric fields on the dielectric constant.
- If a NaCl crystal is subjected to an electric field to 1000 V/m and the resulting polarization is $4.3 \times 10^{-8} \text{ C/m}^2$, calculate the relative permittivity of NaCl. $\epsilon_0 = 8.85 \times 10^{-12} \text{ F-m}^{-1}$.
- What do you mean by hysteresis? Prove that the energy dissipated per cycle per c.c. of magnetization is μ_0 times the area of B-H curve (or I-H curve).

5. Attempt any two parts.

- What is the equation of continuity? Obtain the required expression for it. Also give its physical significance.
- State and explain Poynting theorem for the flow of energy in electromagnetic waves.
- For silver, $\mu = \mu_0$ and $\sigma = 3 \times 10^7 \text{ mhos/m}$. Calculate the skin depth at 10^8 Hz frequency. Given, $\mu_0 = 4\pi \times 10^{-7} \text{ N/A}^2$.

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Attempt any two parts.

- (i) Derive an expression for the electrical conductivity of intrinsic and extrinsic semiconductors? Explain effect of temperature on the conductivity of semiconductors.
- (ii) What is Fermi-Dirac probability distribution function $F(E)$? Plot the graph $F(E)$ versus energy E at 0K and 2000K.
- (iii) Calculate the current produced in a small germanium plate of area 10^{-4} m^2 and of thickness 0.3mm, when a potential difference of 2 volt is applied across the faces. Given, concentration of free electrons in germanium as $2 \times 10^{19} \text{ m}^{-3}$ and mobilities of electrons and holes are $0.36 \text{ m}^2/(\text{V-s})$ and $0.17 \text{ m}^2/(\text{V-s})$ respectively.

7
Attempt any two parts.

- (i) Define transition temperature. Discuss the effect of external magnetic field on superconductors.
- (ii) Distinguish Type-I and Type -II superconductors. How does the magnetization vary with applied magnetic field in type I and type II superconductors?
- (iii) The transition temperature for Pb is 7.2K. However, at 5K it loses the superconducting property subjected to a magnetic field of $3.3 \times 10^4 \text{ A/m}$. Find the maximum value of magnetic field which allow the metal to retain its superconductivity at 0K.

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Time : 3 Hours

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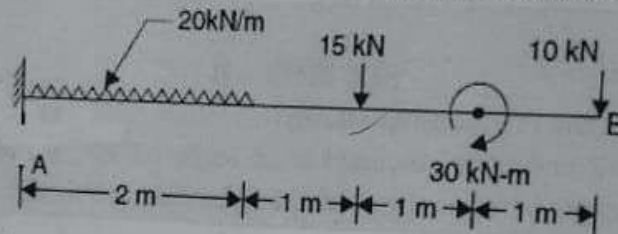
- (f) State the Kelvin Planck and Clausius statements being used for second law of thermodynamics. Further, define; COP of a refrigerator and COP of a heat pump, and show that: $(COP)_{Heat\ pump} = 1 + (COP)_{Refrigerator}$.
- (g) Explain the working of a 2 stroke S.I Engine with the help of neat sketch, P-v and T-s diagram.
- (h) The internal energy of a certain substance is expressed by the equation $u = 3.62pv + 86$ where u is given in kJ/kg, p is in kPa and v is in m^3/kg . A system composed of 5kg of this substance expands from an initial pressure 550 kPa and a volume of 0.25 m^3/kg to a final pressure of 125 kPa, in a process in which pressure and volume are related by $pv^{1.2} = constant$. If the expansion process is quasistatic, determine Q, Change in internal energy and Work for this process.

SECTION - C

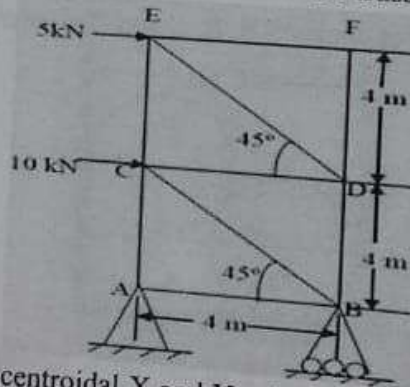
Attempt any two of the following questions:

2 x 10.5 = 21

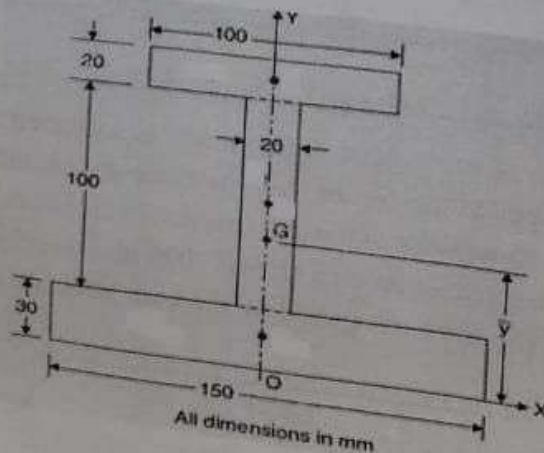
- 3. (a) Derive the relationship between load, shear force and bending moment.
- (b) Draw the SFD and BMD of the a beam loaded beam as shown in fig. below



- 4. (a) Differentiate between perfect, imperfect and redundant truss.
- (b) Determine the forces in all the members of the truss shown in fig. below



- 5. Determine the MOI about centroidal X and Y axis of the I-section as shown in fig. below. All dimension in mm.



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B.TECH.

THEORY EXAMINATION (SEM-II) 2016-17
BASIC ELECTRICAL ENGINEERING

Time : 3 Hours

Max. Marks : 70

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt any seven of the following:

7 x 2 = 14

- a) Write two characteristics of Active elements
- b) The two voltage waves are given: $V_A = 150 \sin(\omega t + 45^\circ)$ $V_B = 75 \sin(\omega t - 15^\circ)$
Which voltage wave is leading with other and what will be the phase angle between V_A and V_B .
- c) What is series resonance?
- d) State Norton's Theorem.
- e) Write four advantages of Three Phase System.
- f) Why Damping torque is provided to an indicating instrument?
- g) Define Magnetomotive Force (mmf).
- h) Write two differences between a transformer and an autotransformer.
- i) Write two applications of Synchronous motor.

SECTION - B

2. Attempt any three parts of the following questions:

3 x 7 = 21

- a) Using Nodal analysis find the current through 1Ω resistance shown in Fig. 1.

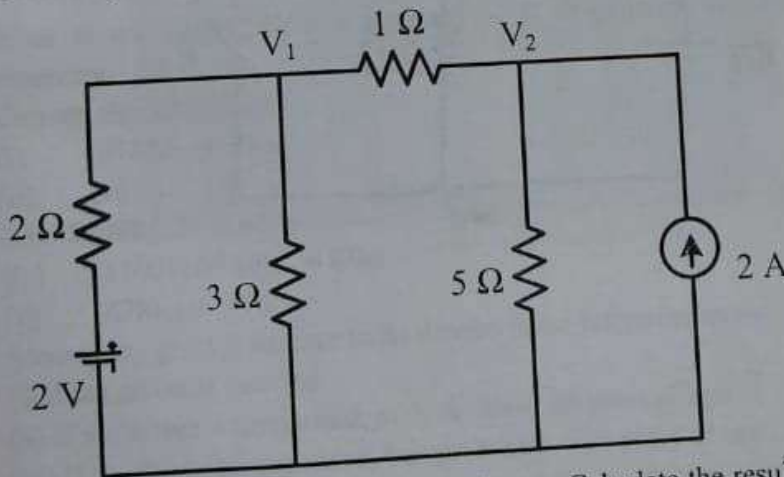


Fig.1

- b) Draw the phasor diagram for the following voltages. Calculate the resultant voltage. Also find the r.m.s. voltage.
 $v_1 = 100 \sin 500t$ $v_2 = 200 \sin(500t + \pi/3)$
 $v_3 = -50 \cos 500t$ $v_4 = 150 \sin(500t - \pi/4)$
- c) Explain the principle and construction of PMMC type instruments. Discuss their merits and demerits.
- d) Deduce analogy between electric circuits and magnetic circuits. Also explain B-H curve and discuss its effect on hysteresis loss.
- e) Derive emf equation of D.C. machine. Also deduce the expression for torque of a dc machine.

SECTION - C

5 x 7 = 35

Attempt any five parts of the following questions:

- 8
- In a 25 kVA, 2000 V/200 V transformer the iron and copper losses are 200 W and 400 W respectively. Calculate the efficiency of half load and 0.8 pf. lagging. Also determine the maximum efficiency and corresponding load.
 - Single phase induction motor is not self-starting. Explain? Name various starting methods of single phase induction motor and explain capacitor run motor.
 - Explain series resonance in RLC circuit. What are the bandwidth and quality factor of the circuit? Derive expressions for lower and upper half power frequencies for a series RLC circuit.
 - A 46 mH inductive coil has a resistance of 10 ohm. How much current will it draw, if connected across 100 V, 50 Hz source? Also determine the value of capacitance that must be connected across the coil to make the power factor of the circuit to be unity.
 - A balanced star connected load of $(8 + j6) \Omega$ per phase is connected to a 3-phase 400 V supply. Find the line current, power factor, 3-phase power and 3-phase volt-amperes. Also draw the phasor diagram.
 - Define power factor. Discuss reasons for poor power factor. How can power factor be improved?
 - A dc shunt generator delivers 50 kW at 250 V when running at 500 rpm. The armature and field resistances are 0.05Ω and 125Ω respectively. Calculate the speed of the same machine and developed torque when running as a shunt motor and taking 50 kW at 250 V.
 - State and prove maximum power transfer theorem. Find the Value of R_L that we can transfer maximum power to it & also calculate the maximum power transferred as shown in Fig.2

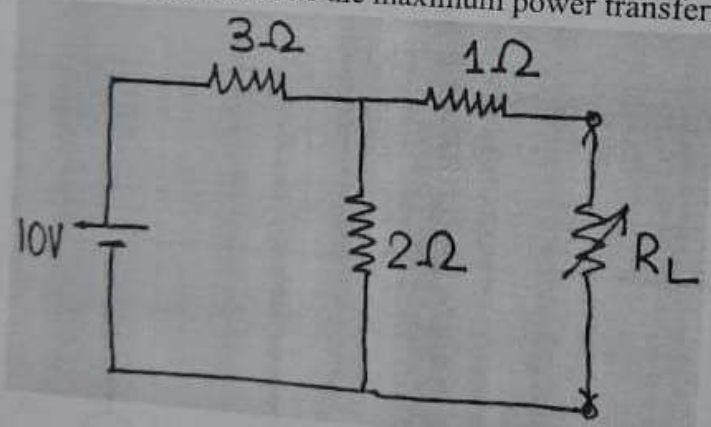


Fig. 2

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B.TECH.
THEORY EXAMINATION (SEM-II) 2016-17
COMPUTER SYSTEM & PROGRAMMING IN 'C'

Time : 3 Hours

Max. Marks: 70

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Explain the following:

7 x 2 = 14

- (a) Write differences between Compiler and Interpreter.
- (b) Write any three differences between Application software and System software?
- (c) Differentiate between structure and union.
- (d) In C programming what will be the value of a, if $a = b \% c$, where $b = -13$ and $c = 5$?
- (e) Differentiate between static and register storage class in C language.
- (f) What is an enumerated data type in C language? Explain.
- (g) Explain the memory hierarchy of a computer system.

SECTION - B

2. Attempt any three of the following questions:

7 x 3 = 21

- (a) What is an algorithm? Give the characteristics of an algorithm. Write an algorithm for printing table of a given positive integer also draw the flow chart for the same.
- (b) Write a program to sum the series $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \dots + \frac{n}{n+1}$
- (c) What is recursion? Write a program in C to generate the Fibonacci series using recursion.
- (d) Convert the following:
 - (i) $(478A)_{16} = (?)_{10}$
 - (ii) $(44)_5 = (?)_7$
 - (iii) $(3142.28)_{10} = (?)_2$
 - (iv) $(11001100.10)_2 = (?)_{16}$
 - (v) $(678)_{10} = (?)_3$
- (e) A company gives insurance to its drivers in the following cases:
 - (i) If the driver is married.
 - (ii) If the driver is unmarried, male & above 30 years of age.
 - (iii) If the driver is unmarried, female & above 25 years of age.
 In all other cases, the driver is not insured. If the marital status, gender and age of a driver are inputs, write a program to determine whether the driver is to be insured or not.

SECTION - C

3. Attempt the following questions:

7 x 5 = 35

Attempt any two of the following:

- i. Write a program to add two matrices A and B of real numbers having dimension 3X3 and store the result in another matrix..
- ii. Explain call by value and call by reference mechanism for function call using proper example.
- iii. Discuss various functional components of digital computer.

4. Attempt any two of the following:
- i. What do you mean by pointers? How pointer variables are initialized? Also write a note on pointer arithmetic with proper example in C language.
 - ii. A five digit number is entered through the keyboard. Write a program to obtain the reversed number and to determine whether the original and reversed numbers are equal or not.
 - iii. Write a note on various approaches to problem solving.
5. Attempt any two of the following:
- i. Write a program to sort an array of integers in ascending order using bubble sort.
 - ii. What is an operating system? Discuss its various functions. Also Compare between Linux and Windows OS.
 - iii. Discuss the various classifications of computer systems.
6. Attempt any two of the following:
- i. What do you mean by macro? What are the applications of macros? Explain types of macro with suitable its examples in C language.
 - ii. Write a program to count the number of characters, spaces and new lines in a text file.
 - iii. Write a program in C to display the prime numbers between 1 and 100.
7. Attempt any two of the following:
- i. Write a program to check whether a given number is Armstrong or not for example:
 $153=1^3+5^3+3^3$
 - ii. What do you understand by conditional compilation? Explain it with an example in C language.
 - iii. What are different data types of operators in C language? Also write a note on operator precedence in C.

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B. TECH.

THEORY EXAMINATION (SEM-II) 2016-17

PROFESSIONAL COMMUNICATION

Time : 3 Hours

Max. Marks : 70

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt all parts of the following questions:

7 x 2 = 14

- What is Topic sentence?
- What is Mass Communication?
- What is the difference between bibliography and reference?
- What do you mean by active listening?
- Differentiate the homophones using them in your sentences of your own: Maize and Maze
- Make plural of the following words: i) Crisis ii) Phenomenon
- Give meaning of the following idioms and used them in your own sentences:
 - At Sixes and Sevens
 - Blessing in Disguise

SECTION - B

2. Attempt any three of the following questions:

3 x 7 = 21

- Distinguish between upward and downward communication along with its merits and demerits.
- What are the techniques used to make a paragraph coherent?
- Write a report on workers' discontent at company's Auxiliary unit. Invent necessary details by yourself.
- What is Negotiation? Describe the characteristics of a good negotiator?
- What is a rose? Answer the question from the point of view of a scientist and a literary artist.

SECTION - C

Attempt all of the following questions:

5 x 7 = 35

3. Comment on body language as a presentation strategy.

OR

Write a note on paralinguistic features.

4. What are the causes of interpersonal barriers?

OR

What are the distinguishing features of technical communication?

5. What aspects of a report are dealt with in 'front matter' and 'back matter'?

OR

What are the qualities of a sales letter? Support your answer with an example.

6. Write a paragraph using Deductive method and underline the Topic sentence. (Invent necessary details yourself)

OR

What are the requisites of sentence construction?

7. What are different humanistic and scientific approaches to human activity?

OR

Man is a part of Nature, in the same sense that a stone is, or a cactus, or a camel. Discuss

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B. TECH.

THEORY EXAMINATION (SEM-II) 2016-17
ENGINEERING CHEMISTRY

Time : 3 Hours

Max. Marks : 70

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION-A

1. Attempt all seven parts in brief. All parts carry equal marks. (7x2=14)
- What are equivalent and non equivalent protons?
 - Why is a block of magnesium attached through an insulated metallic wire to an underground iron pipeline?
 - Define Gross Calorific Value and Net Calorific Value?
 - Give the chemical reactions for the formation of Nylon-6, 6 and Buna- S.
 - A sample of water was found to contain 40.5 mg/L $\text{Ca}(\text{HCO}_3)_2$, 46.5 mg/L $\text{Mg}(\text{HCO}_3)_2$, 32.1 mg/L CaSO_4 , 27.6 mg/L MgSO_4 , 22.45 mg/L CaCl_2 , 19.0 mg/L MgCl_2 and 4.8 mg/L NaCl . Calculate the temporary hardness of water sample.
 - How are greases prepared?
 - What is the composition of Biogas and the raw materials that can be used for generation of biogas?

SECTION - B

2. Attempt any five parts of the following question: 5 x 7 = 35
- Discuss the structure and applications of Fullerenes.
 - What are stoichiometric and non-stoichiometric defects? Explain Frenkel and Schottky defects found in solids.
 - Write a brief note on conducting polymers.
 - How is Grignard reagent prepared? Give the reaction of $\text{CH}_3\text{CH}_2\text{MgBr}$ with HCHO , CH_3CHO and $(\text{CH}_3)_2\text{CO}$?
 - Discuss the principle and working of a galvanic cell.
 - Explain setting and hardening of cement.
 - Discuss the process of reverse osmosis.
 - Explain the process of scale and sludge formation in boilers. How can this be prevented?
 - How can corrosion be minimized by proper design?
 - Give the structure of graphite and explain its lubricating properties.
 - Explain proximate analysis of coal. On burning 0.3 gm of a solid fuel in a bomb calorimeter, the temperature of 3500 gm of water increased from 26.5°C to 29.2°C . Water equivalent of calorimeter and latent heat of steam are 385.0 gm and 587.0 cal/gm, respectively. If the fuel contains 0.7% hydrogen, calculate its gross and net calorific value.
 - Explain the principle of IR spectroscopy. For XY_2 bent molecule show various types of stretching and bending vibrations in IR spectroscopy. Discuss the significance of Finger print region.
 - Why Tetra Methyl Silane is used as an internal indicator in NMR spectroscopy? Give the number of ^1H NMR signals and their splitting pattern in the following compounds:
 - $(\text{CH}_3)_3\text{COCH}_3$
 - $\text{CH}_3\text{CH}(\text{Cl})\text{CH}_2\text{Cl}$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 - $\text{CH}_3\text{CHCHCHO}$

SECTION-C

(2x10.5=21)

Attempt any two questions from this section.

3. (i) State the phase rule and discuss its application to water, vapour and ice system. Is it possible to have a quadruple point in one component system?
 (ii) A zeolite softener was 90% exhausted by removing the hardness completely when 10,000 litres of hard water sample passed through it. The exhausted zeolite bed required 200 litres of 3% NaCl solution for its complete regeneration. Calculate the hardness of water solution.
4. (i) Discuss the mechanism of the preparation of polypropylene using a combination of organometallic compound and transition metal halide. What are the advantages of this process over free radical polymerization?
 (ii) Write a note on polymer composites.
5. (i) Discuss the mechanism of electrochemical corrosion of iron with absorption of oxygen. How can anodic and cathodic metallic coatings help in protection against corrosion?
 (ii) Draw the molecular orbital diagrams of N_2 and O_2 . Calculate their bond orders.

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Time : 3

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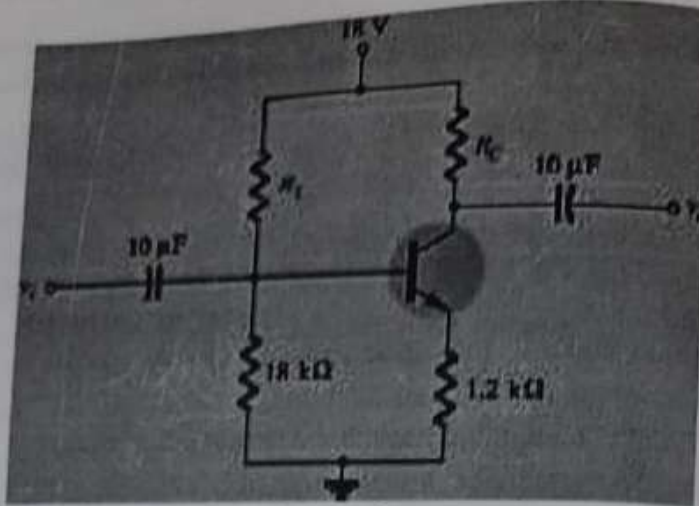


Figure 2

- (f) Draw and explain the block diagram of Ramp type digital voltmeter. Also draw related voltage to time conversion waveforms.
- (g) Derive the expression for AM modulated waveform. Also derive the expression for modulation index.
- (h) Describe the operation of CRT with neat block diagram. How unknown frequency is measured using CRO?

SECTION - C

Attempt any two of the following questions:

2 x 10.5 = 21

- 3. (a) Explain principle of operation and construction of Tunnel diode. Draw its V-I characteristic.
- (b) Design a clamper to perform the function indicated in Figure 3.

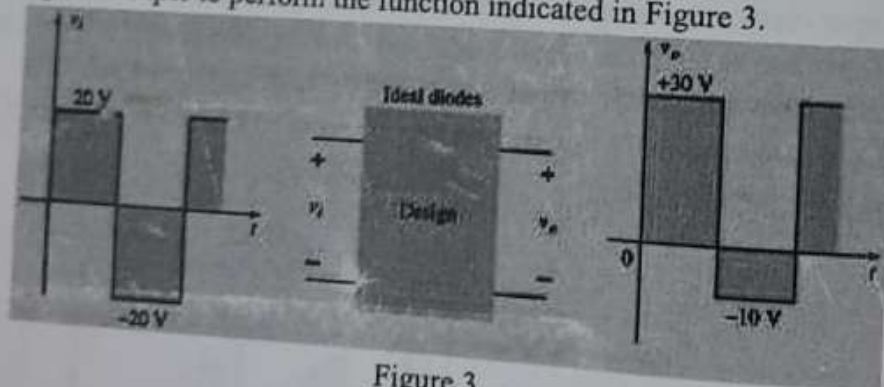


Figure 3

- 4. (a) Draw and explain the N-channel JFET and draw its transfer characteristics.
- (b) Draw and explain the differential amplifier. Define CMRR and slew rate in Op-Amp.
- 5. (a) Draw the CE n-p-n BJT characteristics. Also explain the self bias configuration in DC bias configuration.
- (b) Discuss the need of modulation in the communication engineering. Which types of modulations are used in television?