B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024
I B.Tech. I Semester

BASIC ELECTRICAL SCIENCES
(Common to EEE, CSE & IT)

Time : 3Hrs   Max. Marks : 60

Answer SIX Questions, Choosing ONE Question from each section
All Questions carry equal marks

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SECTION - I

1. (a) Explain active and passive elements.

    (b) Given a delta-connected resistor network with resistors R1=6 Ω, R2=8Ω and R3=10 Ω convert it into an equivalent star-connected network.

2. (a) State and explain Kirchhoff's laws.

    (b) Derive the expression for Delta connected resistances in terms of Star connected resistances.
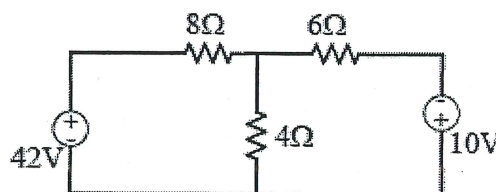
SECTION – II

3. (a) Define the following :i) Reactance ii) Impedance iii) Susceptance and (iv)Admittance.

    (b) Convert (i) 3+j4 into polar form   (ii) 30 $\llcorner$ 70° into rectangular form.

4. (a) Determine the average value, RMS value of a pure sinusoidal Waveform.

    (b) Explain the following terms (i) Instantaneous value (ii) peak value (iii) form factor.

SECTION – III

5. (a) Define power factor, apparent power, active power and reactive power.

    (b) A series circuit consisting of a 10 ohms resistor, a 100 μF capacitance and 10 mH inductance is driven by a 50 Hz AC voltage source of maximum value 100 V. Calculate the equivalent impedance,current in the circuit.

6. (a) Describe the power triangle and its components in an AC circuit.

    (b) Show that current lags voltage in RL series circuit.

SECTION – IV

7. (a) Write the properties of incidence matrix.

    (b) What are the differences between mesh and nodal analysis?

8. (a) Define i) Twig   ii) Link   iii) Cut-set   iv) Tie set.

    (b) In the circuit shown below determine all the branch currents using Nodal analysis

SECTION – V

9. (a) State and explain the Faraday's laws of electromagnetic induction.

   (b) Explain about self and mutual induction.

10. (a) Two coils connected in series-aiding fashion have a total inductance of 250 mH. When connected in a series-opposing configuration, the coils have a total inductance of 150 mH. If the inductance of one coil (L1) is three times the other, find L1, L2, and M. What is the coupling coefficient?

    (b) Explain about dot convention with neat diagrams .

SECTION – VI

11. Obtain the expression for resonant frequency, bandwidth and Q-factor for parallel R-L-C Circuit.

12. (a) For an RLC circuit with a resonant frequency of 500 Hz and a quality factor (Q) of 50, determine the bandwidth and the half-power frequencies.

    (b) Describe the construction and significance of locus diagram for series R-L circuit.

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024
I B.Tech. I Semester

ENGINEERING MECHANICS - I
**(Mechanical Engineering)**

Time : 3Hrs   Max. Marks : 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
*All Questions carry equal marks*
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SECTION - I

1. Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point O as shown in Fig. The angles made by 40 kN, 15 kN and 20 kN forces with X-axis are 60°, 120° and 240° respectively. Determine the magnitude and direction of the resultant force.
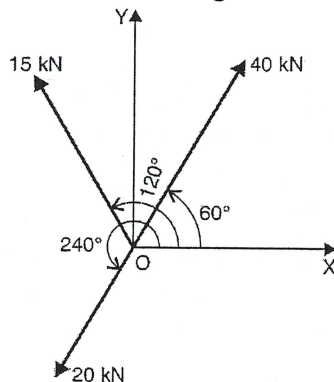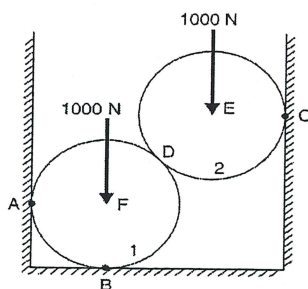

2. Find the resultant of the force system shown in Fig. acting on a lamina of equilateral triangular shape.
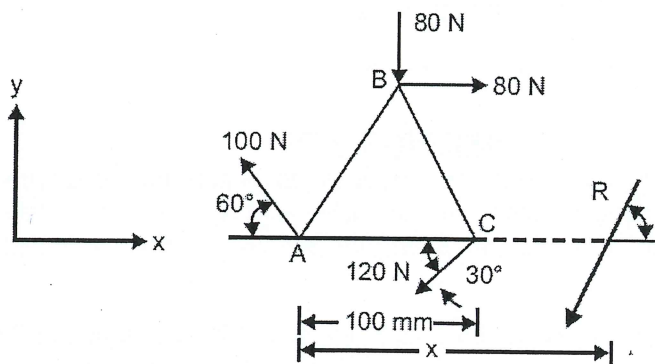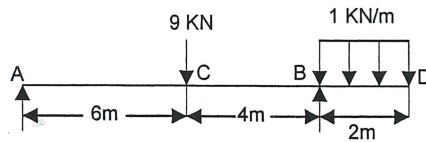

SECTION – II

3. Two spheres, each of weight 1000 N and of radius 25 cm rest in a horizontal channel of width 90 cm as shown in Fig. Find the reactions on the points of contact A, B and C.
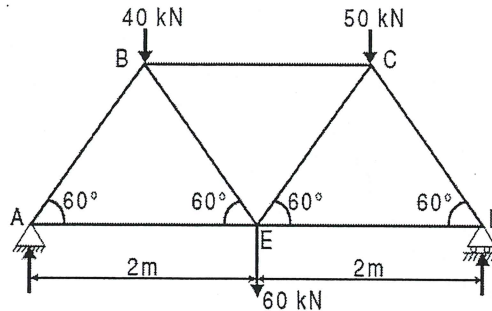
4. find the support reactions for the beam loaded as shown in fig

9 KN   1 KN/m

A   C   B   D

6m   4m   2m

SECTION – III

5. Determine the forces in all the members of the truss shown in Fig. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.

40 kN   50 kN

B   C

60°   60°   60°   60°

A   E   D

2m   2m

60 kN

6. Find the forces in the members *AB, AC* and *BC* of the truss shown in Fig

5 kN

A

60°   30°

B   C

5 m
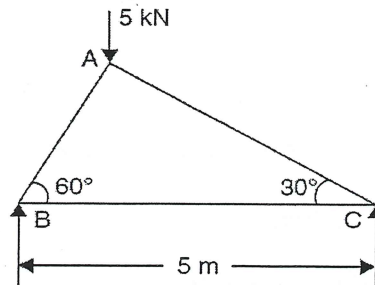
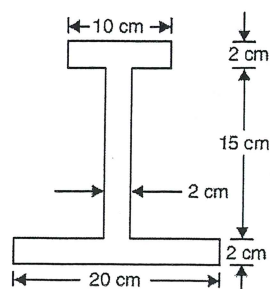## SECTION – IV

7. A pull of 60 N inclined at 25° to the horizontal plane, is required just to move a body placed on a rough horizontal plane. But the push required to move the body is 75 N. If the push is inclined at 25° to the horizontal, find the weight of the body and co-efficient of friction.

8. In a lifting machine, an effort of 500 N is to be moved by a distance of 20 m to raise a load of 10,000 N by a distance of 0.8 m. Determine the velocity ratio, mechanical advantage and efficiency of the machine. Determine also ideal effort, effort lost in friction, ideal load and frictional resistance.

SECTION – V

9. Find the centre of gravity of the I-section shown in Fig.

10 cm   2 cm

15 cm

2 cm

2 cm

20 cm

10. Determine the centroid of the following section Fig .
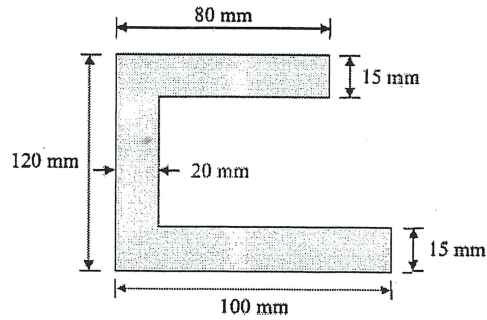
SECTION – VI

11. Determine the moment of inertia about the centroidal axis of the following cross-sections. Also find the radius of gyration. All dimensions are in mm.

12. A cube of 250 mm side has mass density of 4000 kg/m³. Determine the mass moment of inertia of the cube about one of its edges.

R-19

Code : 19SH1102

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024
I B.Tech. I Semester

APPLIED PHYSICS
(Common to EEE ECE, CSE & IT)

Time : 3Hrs

Max. Marks : 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
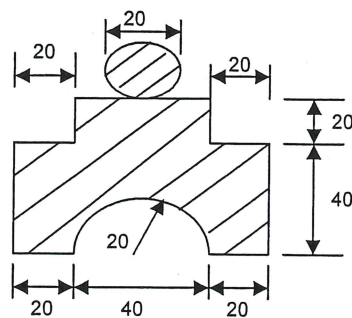*All Questions carry equal marks*

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SECTION - I

1. Describe the Fraunhofer diffraction due to single slit and mention the conditions to get for principal maxima, minimum and secondary maximum positions.

2. (a) Distinguish between Spontaneous & stimulated emission of radiations.

    (b) Explain the characteristics of laser.

SECTION – II

3. Show that FCC is more closely packed than SC and BCC.

4. (a) Describe the powder method for determination of crystal structure.

    (b) Calculate the ratio $d_{100}:d_{110}:d_{111}$ for cubic crystal structure.

SECTION – III

5. (a) State and explain de-Broglie's hypothesis of matter waves.

    (b) Derive Schrodinger's time dependent wave equation.

6. (a) Describe Kronig-penny model to understand the behavior of electrons in varying potential fields of crystals.

    (b) What are the advantages and disadvantages of quantum free electron theory.

SECTION – IV

7. (a) State and explain Hall effect and derive expression for Hall-coefficient in semiconductors.

    (b) Mention the applications of Hall effect.

8. (a) Explain the construction and working of LED.

    (b) What are the applications of LED?

SECTION – V

9. Define internal field? Obtain an expression for the internal field in an atom.

10. (a) Explain soft and hard magnetic materials.

    (b) Describe the origin of magnetic moment in atom.

SECTION – VI

11. (a) Distinguish between type-I and type-II superconductors.

    (b) Explain BCS theory in superconductors.

12. (a) Explain any three properties of nanomaterials.

    (b) Describe the synthesis of nanomaterials by ball-milling method.

R-19   Code : 19SH1103

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024
I B.Tech. I Semester

ENGINEERING CHEMISTRY
(Common to CE & ME)

Time : 3Hrs   Max. Marks : 60

Answer SIX Questions, Choosing ONE Question from each section
All Questions carry equal marks

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SECTION - I

1. (a) Define Hardness of water with example. Differentiate hard and soft water.

    (b) Explain the principle involve in estimation of hardness by EDTA method.

2. (a) Write short notes on scales and sludge.

    (b) Describe the treatment of saline water by reverse osmosis.

SECTION – II

3. (a) Describe the working principle of electrochemical cell with neat diagram.

    (b) What is primary battery? Explain the chemical reactions involved in zinc air battery.

4. (a) List out the various factors influencing corrosion.

    (b) Differentiate dry and wet corrosion.

SECTION – III

5. (a) Distinguish between thermosetting and thermoplastic polymers.

    (b) Describe the preparation, properties and applications of PVC.

6. Illustrate the mechanism involved in the preparation of Bakelite and list out properties and applications of Bakelite.

SECTION – IV

7. (a) Explain the classification of fuels with suitable examples.

    (b) Discuss about Higher calorific value and Lower Calorific value.

8. (a) Write a note on octane number and cetane number.

    (b) Explain the proximate analysis of coal and its significance.

SECTION – V

9. (a) Define refractories and classify it with examples.

    (b) Write short note on flash and fire points.

10. (a) List out important functions of lubricant.

    (b) Explain the chemistry of setting and hardening of cement.

SECTION – VI

11. (a) List out difference between physiorption and chemisorption.

    (b) Explain various method of stabilization of colloids.

12. (a) Classify the colloids based on the physical state.

    (b) Write a note on coagulation of colloids.

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANUARY 2024
I B.Tech. I Semester
PROGRAMMING FOR PROBLEM SOLVING
(Common to All Branches)

Time : 3Hrs   Max. Marks : 60

Answer SIX Questions, Choosing ONE Question from each section
All Questions carry equal marks

* * *

SECTION - I

1. (a) Design a flow chart to find the greatest number among three numbers with the necessary flowchart symbols.

   (b) Explain about different data types in C Programming.

2. (a) What are the qualities and capabilities of good algorithms? Explain.

   (b) Explain about the Structure of C Program, With rules and execution.

SECTION – II

3. (a) Evaluate the expression by using precedence of operators.
   5+2*10/1-3+([++4]-5*2-1)

   (b) Explain in detail about the arithmetic, relational and logical operators in C with Suitable examples.

4. (a) Compare and Contrast Formatted and Unformatted functions.

   (b) List and Explain some of the I/O functions in C Programming.

SECTION – III

5. (a) Write a C-Program for computing the sum(S) of first n natural numbers using for loop.
   S=1+2+3+4+5+…..'n' terms

   (b) Write a C Program of your own choice where else-if ladder is used.

6. (a) Write a C Program to print the below pattern.

   ```
   *
   * *
   * * *
   * * * *
   * * * * *
   ```

   (b) Differentiate between while and do-while loops in C Programming.

SECTION – IV

7. (a) Write a program in C to read n number of values in an array and display them in reverse order.

   (b) Explain about different storage classes in C Programming.

8. (a) Write a C Program to read two arrays A and B, and to perform addition operation A+B and to store the result in C array. Validate all possible cases in the program.

   (b) Explain how to copy the value of one string to another with example.
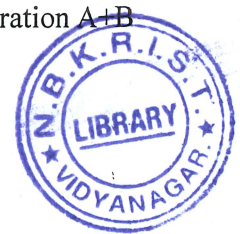
SECTION – V

9. (a) What is pointer and pointer to pointer? Illustrate the declaration and use of pointers and pointer to pointer in C with suitable example program.

   (b) What is function? Write a C function for exchanging the values of two given variables.

10. (a) Write a C Program to print the reverse of a number using recursive function.

    (b) Explain about call by reference with examples.

SECTION – VI

11. (a) Write a short note on command line arguments in C Programming.

    (b) Explain the difference between structures and unions with the help of a C Program.

12. (a) Illustrate the passing of structures to functions through an example.

    (b) Write a C Program to print the contents of a text file in reverse.

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, JANAURY 2024

I B.Tech. I Semester

ENGINEERING MATHEMATICS - I
(Common to All Branches)

Time : 3Hrs   Max. Marks: 60

*Answer **SIX** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks
* * *

SECTION - I

1.   (a)   Solve $x\dfrac{dy}{dx} + y = x^3 y^6$

     (b)   A body kept in air with temperature $25^0 C$ cools from $140^0 C$ to $80^0 C$ in 20 minutes. Find time when the body cools to $35^0 C$.

2.   (a)   Solve $(y^2 - 2xy)dx = (x^2 - 2xy)dy$

     (b)   The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 on one hour. What was the value of N after $1\dfrac{1}{2}$ hours?

SECTION – II

3.   (a)   Solve $(D^2 + 9)y = \cos 3x$

     (b)   Solve $(D^3 + 2D^2 + D)y = e^{2x} + x^2$

4.   Solve $\dfrac{d^2 y}{dx^2} + 3\dfrac{dy}{dx} + 2y = xe^x \sin x$

SECTION – III

5.   (a)   Find $L\left[e^{2t} + 4t^3 - 2\sin 3t + 3\cos 3t\right]$

     (b)   Find $L\left[e^{-3t}(2\cos 5t - 3\sin 5t)\right]$

6.   (a)   Find $L\left[t^2 e^{-2t} \cos t\right]$

     (b)   Find $L\left\{\displaystyle\int_0^t e^{-t}\cos t\, dt\right\}$

SECTION – IV

7.   (a)   Find $L^{-1}\left[\dfrac{s+3}{(s^2 + 6s + 13)^2}\right]$

     (b)   Using the Convolution theorem, find $L^{-1}\left\{\dfrac{s}{(s^2 + a^2)^2}\right\}$

8. Solve $\dfrac{d^2x}{dt^2} + 2\dfrac{dx}{dt} + x = 3te^{-t}$ given $x(0) = 4,\ \dfrac{dx}{dt} = 0$ *at* $t = 0$

SECTION – V

9. (a) Determine the rank of the following matrix

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

(b) Test for consistency and solve
5x+3y+7z=4, 3x+26y+2z=9, 7x+2y+10z=5

10. (a) Find the eigen values and eigen vectors of the matrix

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

(b) Show that if $\lambda_1, \lambda_2, \lambda_3, \ldots\ldots\ldots, \lambda_n$ latent roots of A are, then A^3 has latent roots $\lambda_1^3, \lambda_2^3, \lambda_3^3, \ldots\ldots\ldots, \lambda_n^3$.

SECTION – VI

11. Show that $\log(1 + e^x) = \log 2 + \dfrac{x}{2} + \dfrac{x^2}{8} - \dfrac{x^4}{192} + \ldots\ldots$ and hence deduce that

$$\dfrac{e^x}{e^x + 1} = \dfrac{1}{2} + \dfrac{x}{4} - \dfrac{x^3}{48} + \ldots\ldots\ldots\ldots$$

12. Find the minimum value of $x^2 + y^2 + z^2$, given that $xyz = a^3$.