

BBA / B. Com (Hons.) / B. Tech

Examination 2024-25

(Odd Semester)

**ENVIRONMENT AND ECOLOGICAL
SUSTAINABILITY**

Time : Three Hours]

[Maximum Marks : 60

Note :- Attempt all questions.

SECTION-A

1. Attempt all parts of the following : $8 \times 1 = 8$

- (a) Write about ecology.
- (b) What is pH acidic rain?
- (c) What are main objectives of environmental education?

I.P.T.O.

- (d) Which act is also known as umbrella act?

(e) What is toxic limit of fluoride in drinking water as per WHO?

- (f) Write two examples of in-situ conservation of biodiversity.

- (g) What is biomagnification?

- (h) What is cause of blue baby syndrome?

SECTION - B

2. Attempt any two parts of the following : $2 \times 6 = 12$

- (a) Define term environment. Discuss different segments of environment in brief.
- (b) What is solar cell? Discuss application merits and demerits of solar cell.
- (c) Discuss food related problem in India. How food can be sustainably used to provide food security to people.
- (d) What is environmental legislation? Discuss the role of government in environment protection.

Note:- Attempt all questions. Attempt any two parts from each question. $8 \times 5 = 40$

- 3. (a) Define term ecosystem. Discuss the function and structure of ecosystem and role of producers consumers and decomposers in an ecosystem.
- (b) What is ELR? Discuss temperature behaviour in different layer of atmosphere.
- (c) Differentiate between food chain and food web with suitable example.

- 4. (a) What are uses of minerals? Discuss the impact of mining on environment.

- (b) What is fluorosis? Discuss fluoride problem in drinking water and its removal techniques.

- (c) What is EIA? Discuss the methods of EIA and its benefits.

- 5. (a) Differentiate between primary and secondary air pollutants. Write the removal technique of particulate matter with special reference to electrostatic precipitator.

SECTION - C

- Q (b) What is noise pollution? Write the physical, physiological impact and psychological effect of noise pollution. How it can be controlled?
- Q (c) What is solid waste? Write different types of solid waste. Discuss solid waste management.
6. (a) Define the term NGO's. Discuss the role of NGO's in environment protection.
- (b) What is biological diversity? Discuss the method of biodiversity conservation.
- (c) What is environment management system (EMS)? Discuss different steps of EMS and its benefits.

B. Tech. Examination, 2024-25

(Odd Semester)

ENGINEERING PHYSICS

Time : Three Hours]

[Maximum Marks : 60

Note :- Attempt all questions.

SECTION-A

1. Attempt all parts of the following : $8 \times 1 = 8$
- (a) Why Newton's rings are circular?
 - (b) What do you mean by specific rotation?
 - (c) Distinguish between Fresnel and Fraunhofer class of diffraction.
 - (d) Find the De-Broglie wavelength of an electron accelerated from rest through a potential difference of 100 volts.

[P.T.O.]

(e) What is equation of continuity?

(f) What is the principle of optical fibre?

(g) What was the objective of Michelson-Morley experiment?

(h) What are inertial and non-inertial frame of references?

SECTION-B

2. Attempt any two parts of the following: $2 \times 6 = 12$

(a) In Newton's rings experiment, the diameter of 4th and 12th dark rings are 0.4 cm and 0.7 cm respectively. Find the diameter of 20th dark ring.

(b) An electron has speed of 600 m/s with an accuracy of 0.005%. Calculate the uncertainty in the position of electron.

(c) A particle of rest mass m_0 moves with speed $C\sqrt{2}$. Calculate its mass, momentum, total energy and kinetic energy.

(d) Calculate the numerical aperture, acceptance angle and the critical angle of optical fibre if the core refractive index is 1.50 and cladding refractive index is 1.45.

SECTION-C

Note :- Attempt all questions. Attempt any two parts from each questions. $8 \times 5 = 40$

3. (a) Discuss the effect of introducing a thin plate in the path of one of the interfering beams in biprism experiment. Deduce an expression for the displacement of fringes.

(b) Discuss the phenomenon of Fraunhofer diffraction at a single slit and show that the relative intensities of successive maxima are nearly :

$$1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2} : \frac{4}{49\pi^2}; \dots\dots$$

(c) Explain the construction and working of Nicol prism.

4. (a) Derive Schrodinger's time independent wave equation.

NBS 4102

- (b) Derive a relation between group velocity and phase velocity in dispersive medium. What will be the relation if medium is non-dispersive?
- (c) What do you mean by Bragg's law? Describe Bragg's spectrometer.
5. (a) What do you mean by Poynting vector? Derive Poynting theorem and explain its physical significance.
- (b) Explain the concept of displacement current. How it led to the modification of Ampere's law?
- (c) Explain acceptance angle. What do you mean by numerical aperture? Derive expressions for them.
6. (a) Show that the relativistic invariance of the law of conservation of momentum leads to the concept of variation of mass with velocity.
- (b) Establish Einstein's mass-energy relation.
- (c) Show that space time interval $x^2 + y^2 + z^2 - c^2 t^2$ is invariant under Lorentz transformation.

B. Tech. Examination, 2024-25

(Odd Semester)

ENGINEERING MECHANICS

Time : Three Hours]

[Maximum Marks : 60

Note :- Attempt all questions.

SECTION-A

1. Attempt all parts of the following : $8 \times 1 = 8$

- (a) What are the conditions of equilibrium for non-current force system?
- (b) What is the effect of force and moment on a body?
- (c) What is the difference between a roller support and a hinged support?

I.P.T.O.

- (d) Write the relation between number of joints (j) and number of members (m) in a perfect truss.

perfect truss.

- (e) Define coefficient of friction and angle of friction.

- (f) Define the terms-moment of inertia and radius of gyration.

Derive the relation $F = ma$ where m is mass and a is acceleration and F is force acting on a object.

- (h) Explain Hook's law.

SECTION - B

2. Attempt any two parts of the following : $2 \times 6 = 12$

- (a) A smooth circular cylinder of weight 1000 N and radius 100 mm rests in a right-angled groove whose sides are inclined at an angle of 30° and 60° to the horizontal as shown in figure 1. Determine the reaction R_A and R_C at the points of contact.
- Calculate :
- $IP.T.O.$

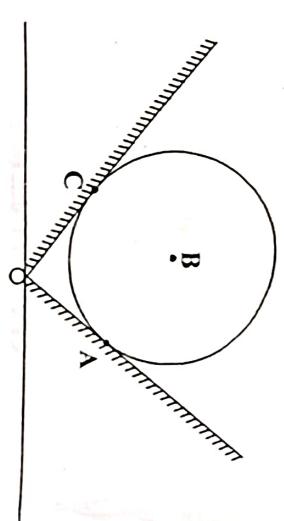


Figure-1

(b) A body of weight W is placed on a rough inclined plane having inclination θ to the horizontal. The force P is applied horizontally to drag the body. If the body is on the point of motion up the plane, prove that P is given by $P = W \tan(\theta + \alpha)$ where α is angle of friction.

- (c) Find an expression for the moment of inertia of a rectangular section about an horizontal axis passing through the base of the rectangular section.

- (d) A mild steel rod of 12 mm diameter was tested for tensile strength with the gauge length of 60 mm. Following observations were recorded : Final length - 80 mm, Find diameter = 7 mm, Yield load = 3.4 kN and ultimate load = 6.1 kN.

- (i) Yield stress
- (ii) Ultimate tensile stress
- (iii) Percentage elongation

SECTION-C

Note :- Attempt all questions. Attempt any two parts from each questions.

$$8 \times 5 = 40$$

3. (a) Four coplaner forces are acting at a point as shown in figure-2. Determine the resultant in magnitude and direction.

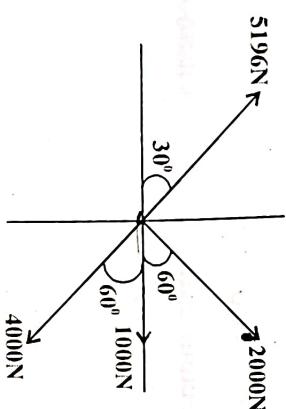


Figure-2

- (b) Four forces are acting along the four sides of a square ABCD as shown in figure-3. Determine the resultant moment about point A if each side of square is 2 meter.



Figure-3

- (c) Three bars, hinged at A and D and pinned at B and C as shown in figure-4. Determine the value of P that will prevent movement of bars.

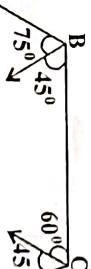


Figure-4

4. (a) An overhanging beam carries loads as shown in figure-5. Calculate the reactions at both ends.

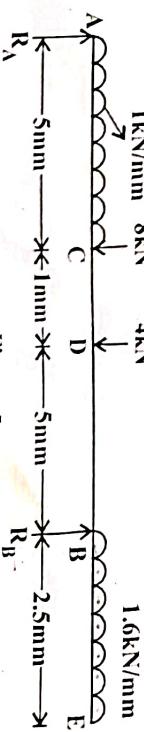


Figure-5

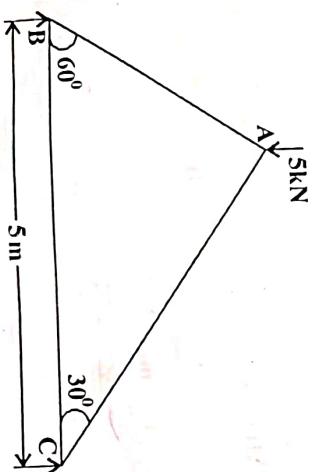
- (b) A uniform ladder of length 10m and weighing 20 N is placed against a smooth vertical wall with its lower end 8 m from the wall. In this position the ladder is just to slip. Determine the coefficient of friction between the ladder and the floor. Also find the frictional force between ladder and floor.

• (c) For a flat belt drive, prove that :

$$\frac{T_1}{T_2} = e^{-\mu \theta}$$

were T_1 is tension on slack side, T_2 is tension on tight side μ is coefficient of friction between belt and pulley, θ is the angle of contact between the belt and pulley.

- 5. (a) Find the forces in the member AB, AC and BC of the truss shown in figure-6 :



- 6. (a) A car is moving with a velocity of 15 m/s, the car is brought to rest by applying brakes in 5 seconds. Determine :
- The retardation
 - Distance travelled by the car after applying brakes.
- (b) Draw the stress strain diagram for mild stress and explain salient points on it.

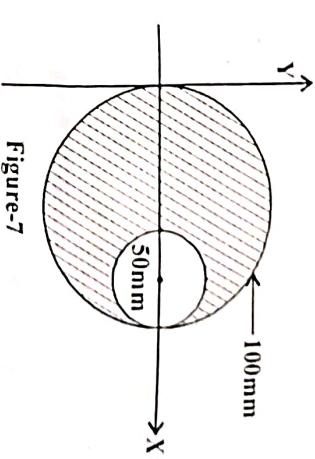


Figure-7

- (b) From a circular plate of diameter 100 mm, a circular part of diameter 50 mm is cut as shown in figure-7. Find the centroid of the remainder.

(c) Explain the following:

- (i) D'Alembert principle
- (ii) Impulse momentum principle
- (iii) Elastic constant

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B. Tech. Examination, 2024-25

(Odd Semester)

MATRICES AND CALCULUS

Time : Three Hours]

[Maximum Marks : 60

Note :- Attempt all questions.

SECTION-A

1. Attempt all parts of the following : $8 \times 1 = 8$

(a) Define skew hermitian and hermitian matrix.

(b) For which value of k, the rank of the given matrix A is 3, where :

$$A = \begin{bmatrix} 2 & 4 & 2 \\ 3 & 1 & 2 \\ 1 & 0 & k \end{bmatrix}$$

(c) Find the n^{th} derivative of $\log x$.

[P. T. O.]

(d) State Euler's theorem for homogeneous functions.

(e) Evaluate:

$$\int_0^1 \int_{y^2}^{2-y} xy \, dx \, dy$$

(d) Show that:

$$\int \int_S \bar{F} \cdot \hat{n} \, dS = \frac{3}{2}$$

where

$$\bar{F} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$$

- (f) Write the value of $\sqrt{\frac{1}{2}}$.
- (g) If $\vec{r} = \sin t \hat{i} + \cos t \hat{j} + t \hat{k}$ find:
- $$\left| \frac{d^2 \vec{r}}{dt^2} \right|$$

and S is the surface of the cube bounded by the planes $x=0, x=1, y=0, y=1, z=0, z=1$.

SECTION - B

2. Attempt any two parts of the following : $2 \times 6 = 12$

- (a) Verify the Cayley-Hamilton theorem for the matrix :

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$

Also find its inverse by using this theorem.

- (b) If $y = \cos(m \sin^{-1} x)$ then prove that :

$$(1 - x^2)y_{n+2} - (2n+1)x y_{n+1} + (m^2 - n^2)y_n = 0$$

- Note :-** Attempt all questions. Attempt any two parts from each questions.
- $8 \times 5 = 40$

SECTION - C

3. (a) Find the rank of the matrix by reducing it into normal form:

$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$

(b) Determine k such that the system of homogeneous equations :

$$2x + y + 2z = 0$$

$$x + y + 3z = 0$$

$$4x + 3y + kz = 0$$

has (i) Trivial solution

(ii) Non-trivial solution

(c) Find the eigen-values and corresponding eigen-vectors of the matrix :

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

4. (a) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that :

$$\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \right)^2 u = \frac{-9}{(x+y+z)^2}$$

(b) Expand $e^x \sin y$ in powers of x and y as for as terms of third degree.

(c) Discuss the maximum and minimum of :

$$x^2 + y^2 + 6x + 12$$

5. (a) Change the order of integration in :

$$I = \int_0^1 \int_{x^2}^{2-x} f(x, y) dy dx$$

(b) Find the area between parabolas $y^2 = 4ax$ and $x^2 = 4ay$.

(c) Evaluate:

$$\int_0^1 \int_1^2 \int_2^3 (x+y+z) dx dy dz$$

6. (a) A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the component of velocity and acceleration at time $t = 1$ in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$.

(b) Prove that :

$$(y^2 - z^2 + 3yz - 2x)\hat{i} + (3xz + 2xy)\hat{j} + (3xy - 2xz + 2z)\hat{k}$$

is both solenoidal and irrotational.

(c) Find the total work done by a force :

$$\bar{F} = (x^2 + y^2)\hat{i} - 2xy\hat{j}$$

in moving a point from $(0, 0)$ to (a, b) along the rectangle bounded by the lines $x = 0$, $x = a$, $y = 0$ and $y = b$.

B. Tech Examination 2024-25

(Odd Semester)

**COMPUTER CONCEPTS & PROGRAMMING
IN C**

Time : Three Hours] [Maximum Marks : 60

Note :- Attempt all questions.

SECTION-A

1. Attempt all parts of the following : $8 \times 1 = 8$

- (a) What do you mean by flowchart?**
- (b) Give the rules for variable declarartion.**
- (c) What is the use of sizeof() operator?**
- (d) Differentiate between break and continue.**
- (e) What is recursion?**

[P. T. O.]

- (f) Write some of the differences between structure and union?
- (g) Why do we use header files?
- (h) What is the full form of EOF?

SECTION - B

2. Attempt any two parts of the following: $2 \times 6 = 12$

- (a) What are the different data types available in "C"? How many bytes are occupied by them?

- (b) Explain the difference between bitwise AND and logical AND operators with the help of examples.

- (c) Write a C program to print the sum of diagonal elements of 2-D matrix.

- (d) Explain different categories of pre-processor directives used in C.

SECTION - C

3. (a) What is an operating system? Mention the types of operating systems and explain any two of them in detail.
- (b) Explain the basic structure of a "C" program.
- (c) Explain the significance of an assembler and compiler.

4. (a) What are different bit operators used in C? Give an example of each.

- (b) Write a program to print the count of even numbers between 1 to 200. Also print their sum.

- (c) What are iterative control statements? Explain the difference between while loop and do while loop.

5. (a) How will you pass parameters to a function? Briefly describe two mechanisms of parameter passing in "C" language.

- (b) What is an array? How a single dimension and two dimension arrays are declared and initialized?

Note:- Attempt all questions. Attempt any two parts from each question. $5 \times 8 = 40$

- (c) Write a C program to read and display student details using structure.
6. (a) How a pointer variable is declared? What is the purpose of data type included in the declaration?
- (b) Explain the following preprocessor directives?
- (i) #include
 - (ii) #define
- (c) Write a short notes on:
- (i) fgets()
 - (ii) fputs()

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Time : Three Hours] [Maximum Marks : 60

Note :- Attempt all questions.

SECTION-A

1. Attempt all parts of the following : $8 \times 1 = 8$
 - (a) What are acceptor and donor impurities?
 - (b) What is the effect of temperature on the reverse current of a P-N-junction?
 - (c) What do you mean by ripple factor?
 - (d) The value of α for a transistor is 0.950. Find the value of β .

I.P.T.O.

- (e) Why BJT transistor is called current controlled device?
- (f) What is pinch-off voltage in a JFET?
- (g) What are the characteristic of an ideal op-amp?
- (h) Define I_{CBO} .

(d) Perform the following subtraction using 1's and 2's - complement method :

$$(42)_{10} - (32)_{10}$$

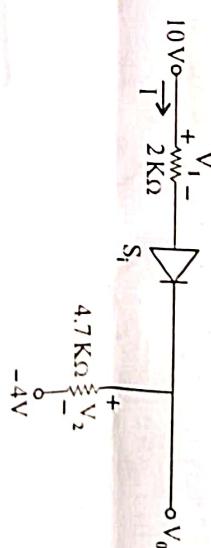
SECTION-C

Note :- Attempt all questions. Attempt any two parts from each questions.

$8 \times 5 = 40$

2. Attempt any two parts of the following : $2 \times 6 = 12$

- (a) Describe the conditions established by forward and reverse-bias conditions on a PN-junction diode and how the resulting current is affected?

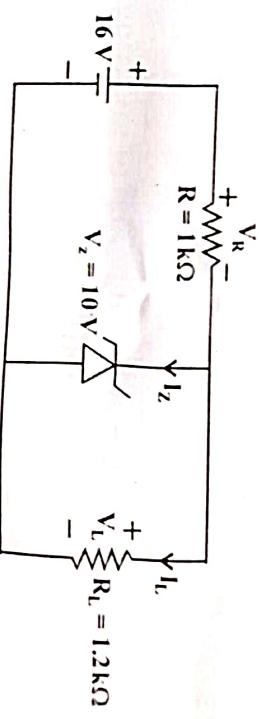


- (b) A full wave bridge rectifier with 220V, 50 Hz sinusoidal input and turns ratio of 5 : 1 has a load resistance of $500\ \Omega$. Diode forward resistance is $20\ \Omega$. Determine :

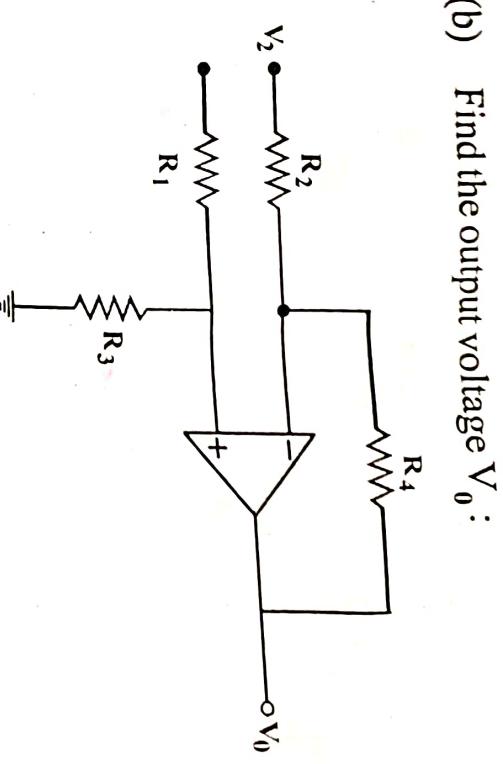
- (i) Mean or average load current
(ii) Rectification efficiency

(iii) Ripple factor

- (c) Explain the basic construction and principle of operation of BJT.



4. (a) Explain the input and output characteristic of a transistor in CB configuration. Also derive the relationship between α and β .
- (b) For a transistor in common emitter configuration, the reverse leakage current is $21 \mu\text{A}$, whereas when the same transistor is connected in common-base configuration it reduces to $1.1 \mu\text{A}$. Calculate values α and β of the transistor.
- (c) Determine I_D , V_{GS} and V_{DS} for the circuit shown in figure :
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6. (a) Simplify the following Boolean expression :
- (i) $A\bar{B} + \bar{A}B + \bar{A}\bar{B} + AB$
- (ii) $A\bar{B}C + \bar{A}BC + ABC$
- (b) Draw the equivalent circuit of OR, AND, XOR and XNOR gates using NAND gates only.
- (b) Find the output voltage V_0 :
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5. (a) Draw the circuit diagram of inverting and non-inverting amplifier and also find the expression for output voltage.

- (c) Explain the term SOP and POS related to Boolean function. Also define the universal gates.

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