

B.Tech. Computer Science and Engineering (CSE) - 1st Sem.
(Credit Based Evaluation & Grading System) (Batch 2024-28)
(2224)

Paper: CEL-1020 Engineering Mechanics

Time Allowed: 3hrs.

Max. Marks: 70

NOTE:

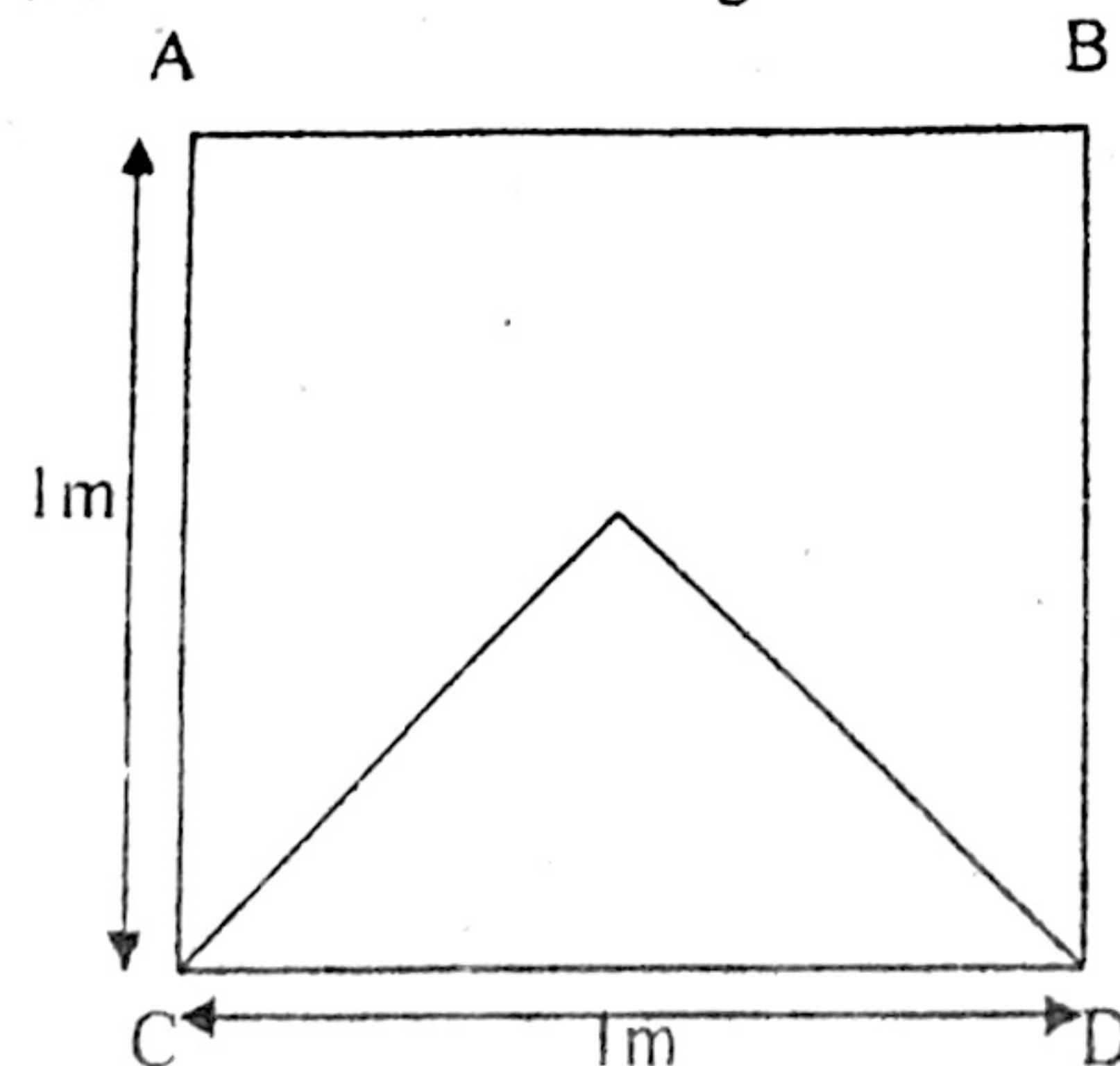
Candidates are required to attempt five questions selecting at least one question from each section. The fifth question may be attempted from any section. All questions carry equal marks.

Section-A

- 1)
 - a) State and explain the fundamental Laws of Mechanics 7
 - b) The resultant of two forces, one being thrice the other is 250 N. If the direction of the larger force is reversed and the other remains unchanged, the resultant reduces to 150 N. Determine the magnitude and angle subtended between the forces. 7
- 2) Explain the following:
 - a) Concurrent and non-concurrent system of forces 7
 - b) Lami's Theorem 7

Section-B

- 3)
 - a) Strike a contrast on the methodology for the analysis of trusses using the method of joints and method of sections. 7
 - b) Explain the classification of trusses in brief. 7
- 4) An isosceles triangle is to be cut from one edge of a square plate of side 1m such that the remaining part of the plate remains in equilibrium in any position when suspended from the apex of the triangle. Find the area of the triangle to be removed. 14



Section-C

- 5) State and prove the Parallel Axis and Perpendicular Axis theorems of moment of inertia. 14

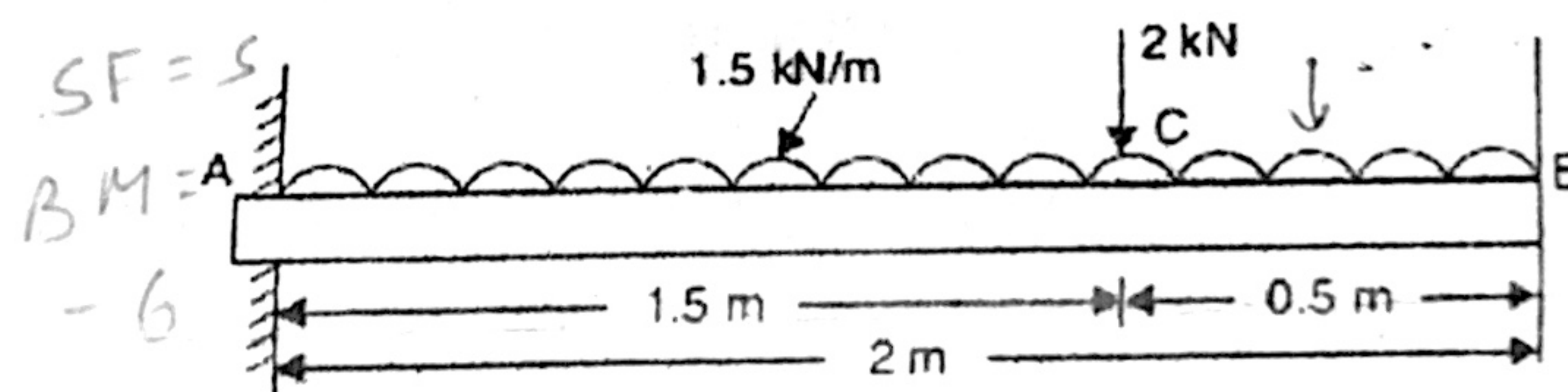
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(2)

- 6)
- A concrete column with a diameter of 50 cm and height 3.5.m stands in the vertical direction. Find the mass moment of inertia of the column considering mass density of concrete as 2500 kg/m^3 . 7
 - What is a rigid body? Distinguish between the translational and rotational motion in case of rigid body. 7

Section-D

- 7)
- A projectile is aimed at a point in the horizontal plane. It misses the target and falls 15 m short when the angle of projection is 15° while it falls ahead of the target by 25 m when the angle is 45° . Find the angle of projection to hit the scheduled target. 7
 - Enumerate the different type of beams with neat sketches. 7
- 8) A cantilever of length 2m carries a uniformly distributed load of 1.5 kN/m run over the whole length and a point load of 2 kN at a distance of 0.5 m from the free end. Draw the shear force and bending moment diagram for the cantilever. 14



$$C = SF = 2.75$$

$$BM = -0.1875$$

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NOTE: - Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

SECTION -A

1. (a) State & prove Gauss's law for dielectrics, also derive its differential form. (9)
(b) A capacitor consists of two metal plates of 100 cm^2 area, placed 2mm apart. The space between the plates is filled with a dielectric having a permittivity of 3.5, & potential difference of 500V is maintained between the plates. Calculate the capacitance & charge on the capacitor? (5)
2. (a) State & prove Ampere's Circuital law. Using this, prove the following equation: -
$$\nabla \times \mathbf{B} = \mu_0 \left[\mathbf{J} + \frac{\partial \mathbf{D}}{\partial t} \right] \quad (10)$$

(b) Prove that electric field inside the conductor is always zero (4)

SECTION-B

3. (a) Using Maxwell's equations, derive the wave equation for electric field of electromagnetic wave. (4)
(b) For plane electromagnetic waves in vacuum, show that electromagnetic waves don't show longitudinal nature but exhibit transverse nature. (10)
4. (a) Derive an expression for reflection of electromagnetic waves by perfect dielectric medium for normal incidence & describe the reflection & transverse coefficient. (10)
(b) Define Poynting vector. An electromagnetic wave propagating in free space is given by: -
$$\vec{E} = E_0 \sin(\omega t - kz) \hat{i} \text{ \& \; } \vec{H} = H_0 \sin(\omega t - kz) \hat{j}$$

Prove that: - $\vec{S} = c\epsilon_0 E^2 \hat{k}$, Given that: - $\frac{E}{H} = \sqrt{\frac{\mu}{\epsilon}}$ (4)

$$\left(\frac{10}{10^9} \text{ m} \right)^2$$

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$$

SECTION-C

5. (a) Explain de-Broglie's concept of matter waves. Then, derive the expression for its wavelength. (7)
(b) What are the differences between Classical mechanics & Quantum mechanics? (7)
6. (a) Obtain the three-dimensional time-independent Schrödinger wave equation from time-dependent Schrodinger wave equation. (10)

$$100 \text{ cm}^2$$

$$\left(\frac{10}{10^9} \text{ m} \right)^2$$

$$\frac{1}{100} \text{ m}^2$$

$$10^{-2} \text{ m}^2$$

(2)

Sr.No.3702

- (b) A particle constrained to move in the domain ($0 \leq x \leq L$) has a wave function, which is given as: $\psi(x) = \sin(n\pi x / L)$ where "n" is an integer. Normalize the wave function. (4)

SECTION-D

7. (a) State Heisenberg's uncertainty principle. Explain the reason behind it, then derive the uncertainty relation between the position & momentum. (7)

- (b) Prove that the energy of a particle confined in an infinite square well potential is given as

$$E_n = \frac{\pi^2 n^2 \hbar^2}{8ma^2}$$

where $V = 0, -a < x < a$

$\infty, x > a$

(7)

8. Find the transmission coefficient of a particle having an energy "E" incident on a finite barrier of height V_0 ($E = V_0$), then explain quantum mechanical tunneling & α -decay. (14)

Sr.No.3653

MCA (FYIP) - 1st Sem. (Credit Based Evaluation and Grading System)
(Batch 2024-29)
(2224)

Paper: PBL-1021 Punjabi Compulsory-I

Time Allowed: 3hrs.

Max. Marks: 70

ਨੋਟ: ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹਨ। ਵਿਦਿਆਰਥੀ ਨੇ ਕੁਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰੇਕ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ-ਇੱਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਅੰਕ ਬਰਾਬਰ ਹਨ।

ਸੈਕਸ਼ਨ-ਏ

1. 'ਰਾਧਾ ਸੰਦੇਸ਼' ਕਵਿਤਾ ਦਾ ਵਿਸ਼ਾ-ਵਸਤੂ ਲਿਖੋ।
2. ਗੁਰਮੁਖੀ ਔਰਥੋਗਰਾਫੀ ਦੀ ਜੁਗਤ ਤੇ ਨੋਟ ਲਿਖੋ।

ਸੈਕਸ਼ਨ-ਬੀ

3. 'ਸਭ ਤੋਂ ਖਤਰਨਾਕ' ਕਵਿਤਾ ਦਾ ਸਾਰ ਲਿਖੋ।
4. ਹੇਠ ਲਿਖਿਆਂ ਵਿੱਚੋਂ ਕਿਸੇ ਇੱਕ ਵਿਸ਼ੇ 'ਤੇ ਲੇਖ ਰਚਨਾ ਕਰੋ:
ੳ) ਸਦਾਚਾਰ
ਅ) ਫੈਸ਼ਨ
ੲ) ਯੁਵਕ ਮੇਲੇ

ਸੈਕਸ਼ਨ-ਸੀ

5. 'ਧਰਤੀ ਹੇਠਲਾ ਬੋਲਦ' ਕਹਾਣੀ ਦਾ ਵਿਸ਼ਾ-ਵਸਤੂ ਲਿਖੋ।
6. ਹੇਠ ਲਿਖੇ ਪੈਰ੍ਹੇ ਵਿਚਲੇ ਅਸ਼ੁੱਧ ਸ਼ਬਦਾਂ ਦਾ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਰੂਪ ਲਿਖੋ:

ਆਮ ਸ਼ੋਚ ਹੈ ਕਿ ਵਰਜਿਸ ਸਿਰਫ ਪਹਲਵਾਨਾ ਜਾ ਖਡਾਰੀਆ ਲਈ ਹੈ ਆਮ ਬਦੇ ਜਾ ਇਸਤਰੀਆ ਨਾਲ ਏਸ ਦਾ ਕੋਈ ਵਾਸਤਾ ਨਹੀਂ। ਵਰਜਿਸ ਸਕੂਲਾ-ਕਾਲਜਾ ਦੇ ਸਲੇਵਸ ਦਾ ਵੀ ਹਿਸਾ ਨਹੀਂ। ਇਹ ਵੀ ਖਆਲ ਹੈ ਕਿ ਇਸਦਾ ਸਬਧ ਸੁਡੋਲਤਾ ਅਤੇ ਤਾਂਕਤ ਨਾਲ ਹੈ ਸਹਿਤ ਨਾਲ ਨਹੀਂ। ਪਰ ਏਹ ਸਬ ਗਲਤ ਖਆਲ ਹਨ। ਵਰਜਿਸ ਖੁਰਾਕ ਦੀ ਤਰਾ ਸਹਿਤ ਲਈ ਜਰੂਰੀ ਹੈ। ਏਹ ਸ਼ਰੀਰ ਨੂੰ ਅਰੋਗ ਰਖਨ ਵਿਚ ਸਹਾਏਕ ਹੈ। ਅਰੋਗ ਤਣ ਤੇ ਮਣ ਹੀ ਖੇੜੇ ਦਾ ਸ਼੍ਰੋਤ ਹਨ।

ਸੈਕਸ਼ਨ-ਡੀ

7. 'ਆਟੋ ਨੰਬਰ 420' ਕਹਾਣੀ ਦਾ ਵਿਸ਼ਾ-ਵਸਤੂ ਲਿਖੋ।
8. ਹੇਠ ਲਿਖੇ ਵਿਸ਼ਿਆਂ ਸਬੰਧੀ ਅਖ਼ਬਾਰੀ ਇਸ਼ਤਿਹਾਰ ਲਿਖੋ:
ੳ) ਕੰਨਿਆ ਦੀ ਲੋੜ ਸਬੰਧੀ ਅਖ਼ਬਾਰੀ ਇਸ਼ਤਿਹਾਰ
ਅ) ਪਲਾਟ ਵੇਚਣ ਸਬੰਧੀ ਅਖ਼ਬਾਰੀ ਇਸ਼ਤਿਹਾਰ

B.Tech. Computer Science and Engineering (CSE) - 1st Sem.
(Credit Based Evaluation & Grading System) (Batch 2024-28)
(2224)

Paper: MEL-1010 Introduction to Engineering Materials

Time Allowed: 3hrs.

Max. Marks: 70

Note: Attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. All questions carry equal marks.

SECTION A

Q1 (a) What is engineering material? Define historical evolution and scope of engineering material.

projections of the line.

(b) What are the important physical and chemical properties of a material?

Q2 Explain the different atomic bonding in solids with suitable examples.

SECTION B

Q3 Explain the various types of imperfections in crystalline materials in detail.

Q4 Write the procedure to calculate crystallographic planes, and sketch within a cubic unit cell, the following planes: (i) (012), and (ii) (301).

SECTION C

Q5 Discuss the concept of diffusion and explain steady state and non-steady state diffusion, also drive and explain Fick's first law of diffusion.

Q6 Draw the Iron-carbon equilibrium phase diagram, and explain the various reaction involved while heating and cooling the steel.

SECTION D

Q7 What are polymers? Explain the difference between addition and condensation polymerization and differentiate between thermosetting and thermoplastics polymers.

Q8 What are ceramic materials? Discuss in detail the mechanical, electric and thermal properties of ceramics.

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Paper: MEL-1021 Engineering Graphics & Drafting Using AutoCAD

Time Allowed: 3hrs.

Max. Marks: 70

Note: Attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. All questions carry equal marks.

Section-A

1. Draw the projections of the following points
 - (I) Point P lies in the HP and 22 mm behind the VP.
 - (II) Point Q lies in the VP and 32 mm below the HP.
 - (III) Point R lies 32 mm below the HP and 22 mm Behind the VP.
2. A straight-line AB, 60 mm long, makes an angle of 25° to the HP and 55° to the VP. The end A is in the VP and 20 mm above the HP. Draw the projections of the line.

Section-B

3. Construct a diagonal scale to measure 0.01 and 0.1 of a metre and long enough to measure up to 6 metres when 1 metre is represented by 2.5 centimetres. Find RF and indicate on the scale, the distances: 5.55 and 3.33 metres.
4. A rectangle ABCD of size 30 mm x 20 mm is inclined to the HP at 30° . Its shorter side AB is parallel to the HP and inclined at 45° to the VP. Draw the projections of the rectangle.

Section-C

5. A cone of base diameter 40 mm and slant height 60 mm is kept on the ground on its base. An AIP inclined at 45° to the HP cuts the cone through the midpoint of the axis. Draw the development.
6. Define various 'point fixing methods' used in AutoCAD with suitable diagram.

Section-D

7. Draw the Isometric view of a circle by using 'Four-centre method' and 'Points method'
8. Define any five 'draw' commands used in AutoCAD.

B.Tech. Electronics & Communication Engineering (ECE) - Ist Sem.
(Batch 2024-28) (CBEGS)
(2224)

Paper : MTL-1001 : Mathematics-I

Time allowed: 3 hrs.

Max. Marks: 70

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

$$\Rightarrow \lambda^2 - 6\lambda + 3 = 0$$

Section-A

1(a) Using the Gauss-Jordan method, find the inverse of the matrix $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$.

(b) Prove that every square matrix can be uniquely expressed as $P + iQ$, where P and Q are Hermitian matrices. (7+7)

2(a) Find the matrix P which transforms the matrix $A = \begin{bmatrix} 8 & 8 & 2 \\ 4 & -3 & 2 \\ 3 & 4 & 1 \end{bmatrix}$ to the diagonal form.

(b) Show that the given system of equations

$$x + y + z = 9, \quad 2x + 5y + 7z = 52, \quad 2x + y - z = 0$$

are consistent and solve them. (7+7)

Section-B

3(a) If $z = x f\left(\frac{y}{x}\right) + g\left(\frac{y}{x}\right)$, prove that $x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = 0$.

(b) Let $r^2 = x^2 + y^2 + z^2$ and $V = r^m$, prove that $V_{xx} + V_{yy} + V_{zz} = m(m+1)r^{m-2}$. (7+7)

4(a) If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$, then show that $\frac{\partial(u, v, w)}{\partial(x, y, z)} = 4$.

(b) Find the maximum and minimum distances of the point $(3, 4, 12)$ from the sphere $x^2 + y^2 + z^2 = 4$. (6+8)

Section-C

5(a) Evaluate $\iint_R xy(x+y) dx dy$ over the region R bounded by the curve $y = x^2$ and the line $y = x$.

(b) Find, by triple integration, the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. 48
 $\frac{2^1}{2^2} (7+7)$

6(a) By changing to polar coordinates, evaluate $\iint \sqrt{\frac{1-x^2-y^2}{1+x^2+y^2}} dx dy$ over the positive quadrant of the circle $x^2 + y^2 = 1$. 48
 $\frac{2^1}{2^2}$

(b) Evaluate $\iiint (x+y+z) dx dy dz$ over the tetrahedron bounded by the planes $x=0$, $y=0$, $z=0$ and $x+y+z=1$. 24
 $\times 78$
168
 $\times 3$
504

Section-D

7(a) Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the point $(2, -1, 2)$. 168
3
504
31
20
18
24

(b) Compute the line integral $\int_C (y^2 dx - x^2 dy)$ around the triangle whose vertices are $(1, 0)$, $(0, 1)$ and $(-1, 0)$ in the positive sense. (7+7)

8(a) If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, $r = |\vec{r}|$ and $r \neq 0$, show that $\text{Curl}(\text{grad } r^n) = 0$.

(b) Evaluate by Green's theorem $\int_C [(x^2 - y^2) dx + 2xy dy]$, where C is the closed curve of the region bounded by $y^2 = x$ and $x^2 = y$. (7+7)
