1/5/2018 AR

R16

Code No: 131AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May - 2018

MATHEMATICS-I

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Find an integrating factor for the following equation $\frac{dy}{dx} = e^{2x} + y - 1$. [2]

b) Find the solution of $\frac{dy}{dx} = -\frac{x}{y}$ at x=1 and y=$\sqrt{3}$. [3]

c) Find the value of α such that the vectors (1, 1, 0), (1, α, 0) and (1, 1, 1) are linearly dependent. [2]

d) Determine whether the system of equations is consistent $\begin{aligned} 2x - 3y + 5z &= 1 \\ 3x + y - z &= 2 \\ x + 4y - 6z &= 1 \end{aligned}$ [3]

e) If λ is the Eigen value of a matrix A then derive the Eigen value of (adjoint$A$). [2]

f) Taking A as a 2 ×2 matrix show that the Eigen values of A = the trace of A. [3]

g) If $u = x^y$ show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$. [2]

h) Find the stationary values of $xy(a - x - y)$. [3]

i) Eliminate the arbitrary function f from the equation and form the partial differential equation $z = xy + f(x^2 + y^2)$. [2]

j) Eliminate the constants a and b from the equation: $z = (y + a)(x + b)$. [3]

PART-B

(50 Marks)

2.a) Solve the Following differential equations:
$y'' - 2y' + y = te^t + 4, \quad y(0) = 1, \quad y'(0) = 1$

b) Find the orthogonal trajectories for the family of curves $r^n \sin n\theta = a^n$. [5+5]

OR

3.a) In an L-R circuit an e.m.f. of 10 sin t volts is applied. If I(0)=0, find the current I(t) in the circuit at any time t.

b) Solve the Following differential equation $y'' + 2y' + 5y = 4e^{-t}\cos 2t, \quad y(0) = 1, \quad y'(0) = 0$. [5+5]

4.a) Find an LU factorization for the matrix $\begin{bmatrix} 1 & 2 \\ -3 & -1 \end{bmatrix}$

b) In the following equations determine, for what value of "k" if any will the systems have i) unique solution ii) no solution iii) Infinitely many solutions

$$kx + 2y = 3$$
$$2x - 4y = -6$$

[5+5]

OR

5.a) Use either the Gaussian Elimination or the Gauss Jordan method to solve

$$x + 2y - 3z = 9$$
$$2x - y + z = 0$$
$$4x - y + z = 4$$

b) Using the theory of matrices, find the point such that the line of intersection of the planes $3x + 2y + z = -1$ and $2x - y + 4z = 5$ cuts the plane $x + y + z = 4$. [5+5]

6.a) Obtain the Eigen values of the following matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ and verify whether its Eigen vectors are orthogonal.

b) Show that 0 is an Eigen value of a matrix A if and only if it is singular. [5+5]

OR

7.a) If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ then show that $A^n = A^{n-2} + A^2 - I \;\; for\; n \geq 3$. Hence find A^{50}.

b) Show that the matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ is not similar to a diagonal matrix. [5+5]

8.a) If $\sin u = \frac{x^2y^2}{x+y}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3\tan u$.

b) If $f(0) = 0 \; and \; f'(x) = \frac{1}{1+x^2}$ then using Jacobians show that $f(x) + f(y) = f\left(\frac{x+y}{1-xy}\right)$.

[5+5]

OR

9.a) Expand $e^x \cos y \; in\, powers\, of\, x\, and \left(y - \frac{\pi}{2}\right)0$.

b) Show that the rectangular solid of maximum volume that can be inscribed in a given sphere is a cube. [5+5]

10. Find the general integrals of the linear partial differential equations

$a)\; y^2p - xy\,q = x(z - 2y)$

b) $(y + zx)p - (x + yz)q = x^2 - y^2$. [5+5]

OR

11. Find complete integrals of the following equations

a) p+q=pq

b) $p^2q(x^2 + y^2) = p^2 + q$. [5+5]

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R15

Code No: 121AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May - 2018

ENGINEERING MECHANICS

(Common to CE, ME, MMT, AE, AME, MIE, PTM, MSNT)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.
Illustrate your answers with NEAT sketches wherever necessary.

PART- A

(25 Marks)

1.a) State the conditions for a particle to be in equilibrium in space. [2]

b) Classify the system of forces with neat sketches. [3]

c) What are surface irregularities? How do they affect the relative motion of bodies over one another? [2]

d) Explain the terms: Limiting friction, Angle of repose, Coefficient of static friction. [3]

e) Under what condition is the i) centre of gravity of a wire same as the centroid of its centre line, ii) centre of gravity of a plate same as the centroid of its surface area? [2]

f) Show that the mass moment of inertia of a thin circular ring of mass M and mean radius R with respect to its geometrical axis is MR^2. [3]

g) Express the velocity and acceleration vectors in terms of rectangular components. [2]

h) A cannon can fire a bomb with a release velocity of 75 m/s. If the length of the barrel is 1 m, and the mass of the bomb is 1200 kg, determine the force acting on the bomb. [3]

i) Distinguish between centre of oscillation and centre of suspension. [2]

j) State the kinetic equations of motion in i) centroidal rotation, ii) non – centroidal rotation, and iii) general plane motion. [3]

PART-B

(50 Marks)

2. A system of forces act as shown in figure 1. Find the magnitude of the forces A and B so that the resultant of the force system passes through P and Q. [10]

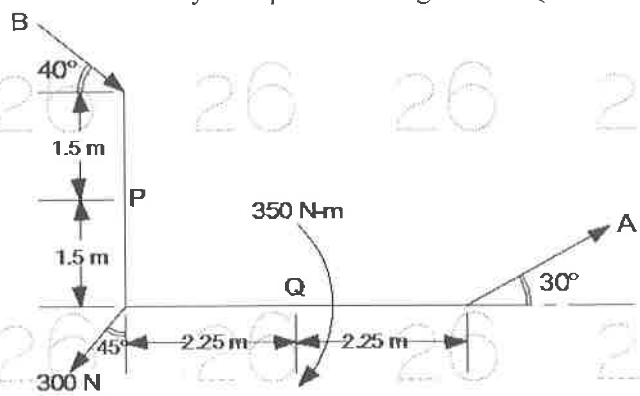

Figure: 1

OR

3. Determine the resultant of the force system acting in the plane shown in figure 2. Locate the distance from A where the resultant cuts the $x-$axis. [10]

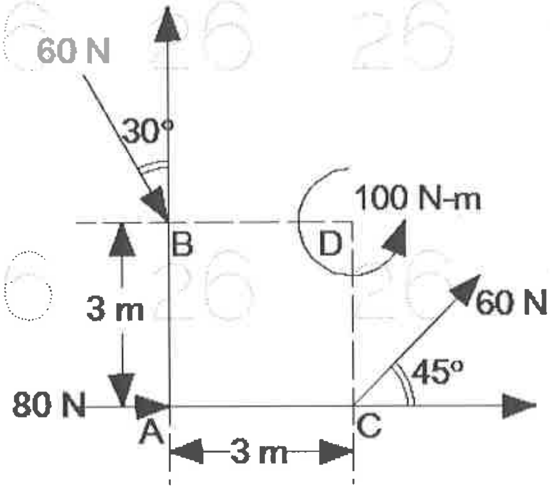

Figure: 2

4. A 12^0 wedge is pushed inside a gap in between two blocks by a vertical force P as shown in figure 3. Determine the value of P to just move the 1000 kg block to the left. Also, find the value of W to maintain equilibrium. The coefficient of friction at all the contact surfaces is 0.25. [10]

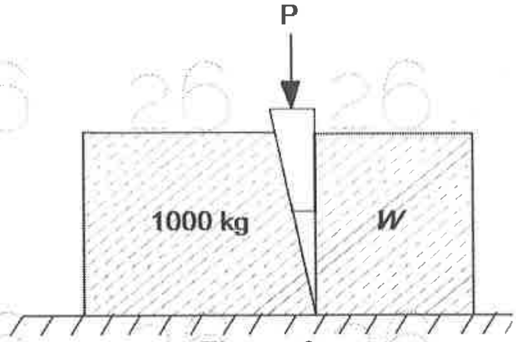

Figure: 3

OR

5. What maximum HP can be transmitted per square cm of cross-section, if the tension in the belt is not to exceed 25 kg/cm^2 and the ratio of the tension in the tight side to the tension in the slack side is 1.8? Assume the weight of 1 cu cm of belt as 0.0011 kg. [10]

6. A cone of base diameter 200 mm is fitted centrally to a hemisphere of diameter 200 mm. What should be the height of the cone so that the centroid of the combination solid lies at the junction between the cone and hemisphere? [10]

OR

7. Find the moment of inertia of the section shown in figure 4 about the x and y centroidal axes. All dimensions are in mm. [10]

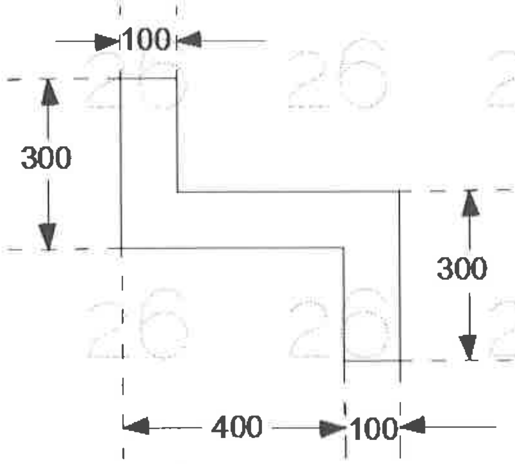

Figure: 4

8. A projectile is fired with an initial velocity of 250 m/s at a target located at a horizontal distance of 4 km and a vertical distance of 700 m above the gun. Determine the value of the firing angle to hit the target. Neglect air resistance. [10]

OR

9.a) The angular rotation of a body is given as the function of time by the equation $\theta = \theta_0 + at + bt^2$, where θ_0 is the initial angular displacement, a and b are constants. Obtain the general expression for the (i) angular velocity, and (ii) angular acceleration of the body. If the initial angular velocity be 3π radians/s, and after two seconds the angular velocity is 8π radians/s, find the constants a and b.

b) Derive the $x - t$, $v - t$, and $a - t$ relationships for uniformly accelerated motion. [5+5]

10.a) Determine the angular velocity of the earth assuming it to be a perfect square revolving about the north and south poles. If the radius of earth is 6370 km, and its mass is 6×10^{24} kg, find its angular momentum and rotational kinetic energy.

b) State the work – energy principle and conservation of mechanical energy for a rigid body motion. [5+5]

OR

11.a) A body of 4 kg mass, when suspended from a spring, extends it by 10 cm. If a body of mass 1.5 kg is suspended from the same spring, determine the elongation of the spring. If it is pulled by 1 cm from its equilibrium position and released, determine the period of vibration, amplitude, and maximum velocity.

b) Distinguish between simple pendulum and compound pendulum. [5+5]

---ooOoo---

R15

Code No: 121AL

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May - 2018

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours **Max. Marks: 75**

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Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) If $\sum_{i=1}^{10} x = 15$, $\sum_{i=1}^{10} y = 23, \sum_{i=1}^{10} x^2 = 25$ and $\sum_{i=1}^{10} xy = 55$, find best fit of straight line $y = a + bx$. [2]

b) Find the missing value from the following data [3]

x	0	1	2	3
f(x)	2	-	5	10

c) Let $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$, find L and U using LU decomposition method. [2]

d) Find the approximate value of $\sqrt[3]{30}$ using Newton's Raphson method. [3]

e) Define finite Fourier sine and cosine transforms. [2]

f) Find the half range sine series of $f(x) = x$ on $(0, l)$ [3]

g) Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$ [2]

h) Form the partial differential equation from $z = (x^2 + a)(y^2 + b)$ by eliminating the arbitrary constants a, b. [3]

i) Define divergent of a vector point function and what does its geometrical meaning? [2]

j) Let $\overline{F} = (x^2 - yz)\bar{i} + (y^2 - xz)\bar{j} + (z^2 - xy)\bar{k}$ is an irrotational vector, find its scalar potential function. [3]

PART-B

(50 Marks)

2. Define interpolation, and Find the interpolate polynomial from the following data

x	0	1	2	3	4
y	3	6	11	18	27

and hence find the value of $y(0.1)$, $y(2.1)$ and $y(4.5)$. [10]

OR

3. Given points (1, -8), (2, -1) and (3, 18) satisfying the function $y = f(x)$, Determine the values of $y(2.5)$ and $y(2.0)$, using the Cubic spline approximation. [10]

4.a) Find the positive root of the equation $3x = \cos x + 1$ by iteration method.

b) Solve the following system by Gauss-Seidel method

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

[5+5]

OR

5.a) Evaluate $\int_0^2 e^{-x^2} dx$ using Trapezoidal rule as well as Simpson's rule, taking step size h=0.2.

b) Use Adams-Bashforth Moulton method, find y(0.8) from $\frac{dy}{dx} = x + y$, y(0)=1. Find the initial values y(0.2), y(0.4) and y(0.6) from Taylors series method. [5+5]

6.a) Let $\bar{f}_s(p)$ and $\bar{f}_c(p)$ are Fourier sine and cosine transform of $f(x)$, Prove that $F_c\{xf(x)\} = \frac{d}{dp}\bar{f}_s(p)$ and $F_s\{xf(x)\} = -\frac{d}{dp}\bar{f}_c(p)$

b) Obtain the Fourier series expansion of f(x) = |x| in (- π, π) and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots\ldots$ [5+5]

OR

7.a) Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{for } -1 < x < 1 \\ 0 & \text{for } x < -1, x > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$.

b) Find the Fourier sine transform of xe^{-2x}, $x > 0$. [5+5]

8. Find the solution of the one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ under the boundary conditions $u(0,t) = 0$, $u(l,t) = 0$ and $u(x,0) = x(l - x)$, $0 < x < l$, l being the length of the rod. [10]

OR

9.a) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

b) Solve $z^2(p^2x^2 + q^2) = 1$ [5+5]

10.a) Applying Green's theorem, evaluate $\int_c (y - \sin x)dx + \cos x dy$, where C is the plane triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $y = \frac{2x}{\pi}$.

b) Use Divergence theorem to evaluate $\int_S \vec{F} \bullet \bar{n} ds$ over the surface of sphere $x^2 + y^2 + z^2 = a^2$ where $\overline{F} = 3x\bar{i} + 3y\bar{j} + 3z\bar{k}$. [5+5]

OR

11. Verify Gauss divergence theorem for $\overline{F} = (x^3 - yz)\bar{i} - 2x^2 y\bar{j} + z\bar{k}$ taken over the cube bounded by the planes $x = y = z = a$. [10]

---ooOoo---

Code No: 111AC **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
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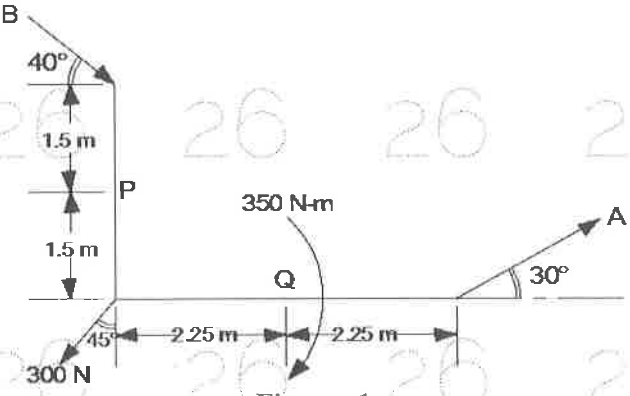

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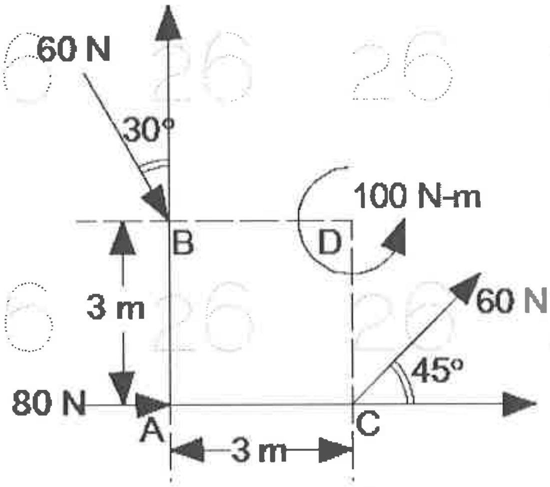

Figure: 2

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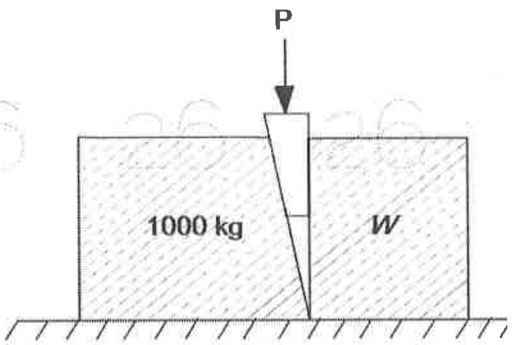

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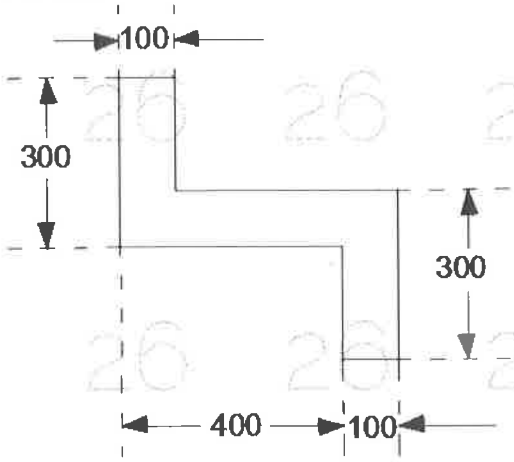

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---ooOoo---

R13

Code No: 111AL

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
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7.a) Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{for } -1 < x < 1 \\ 0 & \text{for } x < \text{-}1, x > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$.

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9.a) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

b) Solve $z^2(p^2x^2 + q^2) = 1$ [5+5]

10.a) Applying Green's theorem, evaluate $\int_c (y - \sin x)dx + \cos x dy$, where C is the plane triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $y = \frac{2x}{\pi}$.

b) Use Divergence theorem to evaluate $\int_S \bar{F} \bullet \bar{n} ds$ over the surface of sphere $x^2 + y^2 + z^2 = a^2$ where $\bar{F} = 3x\bar{i} + 3y\bar{j} + 3z\bar{k}$. [5+5]

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11. Verify Gauss divergence theorem for $\bar{F} = (x^3 - yz)\bar{i} - 2x^2y\bar{j} + z\bar{k}$ taken over the cube bounded by the planes $x = y = z = a$. [10]

---ooOoo---

R07

Code No: Z0221

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May - 2018

APPLIED PHYSICS

(Common to EEE, ECE, CSE, IT)

Time: 3 hours **Max. Marks: 80**

Answer any five questions

All questions carry equal marks

\- - -

1.a) Show that the packing fraction of FCC is more than SC and BCC.
b) What is Cohesive energy? Estimate cohesive energy of ionic solids.
c) Write a short note on Laue method. [6+6+4]

2.a) Explain Heisenberg Uncertainty Principle.
b) Show that the energies of a particle in one dimensional potential box are quantized.
c) Explain physical significance of wave function. [4+8+4]

3.a) Distinguish between classical free electron theory and Quantum free electron.
b) Discuss Kronig Penney model for the motion of an electron in a periodic potential.
c) Explain classification of materials on the basis of band theory of solids. [4+8+4]

4.a) Derive an expression for Clausius Mossotti relation.
b) Write a note on classification of magnetic materials.
c) Explain piezo electricity. [6+6+4]

5.a) Distinguish between direct band gap and indirect band gap semiconductors.
b) Write a short note on BCS theory.
c) What is Hall effect? Derive an expression Hall coefficient. [4+6+6]

6.a) With neat diagram explain mechanism and principle of semiconductor laser.
b) What are the general characteristics of lasers?
c) Write a note on He-Ne gas laser system. [6+4+6]

7.a) Describe the classification of optical fibers on the base of refractive index.
b) Discuss construction and reconstruction of image on hologram.
c) What are the applications of optical fibers? [6+6+4]

8.a) What is Nano? Explain the significance of the Nanomaterials.
b) Write a note on carbon nanotubes.
c) What are the applications of Nanomaterials? [6+6+4]

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