ME-L

Total No. of Questions: 22   Total No. of Pages: 02

Roll No. _____   Paper Code
                                                   3E1206

B.Tech. III-Sem (Main & Back) 2025-26
Aeronautical Engineering
3AN2-01 Advanced Engineering Mathematics-I
AN,AG,AE,CE,CR, EC,EI,ME,MH,PI,PT,BM
3E1206

Time : 3 Hours   Maximum Marks : 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____   2. _____

_____

Part A
(Answer should be given up to 25 words only)
All questions are compulsory .   10x2=20

1. With usual notation prove that $\mu = E^{-\frac{1}{2}} + \frac{1}{2}\delta$

2. Write Newton cotes Quadrature formula.

3. Write the corrector formula of Adam's predicator corrector method.

4. Define transcendental equation with examples.

5. Find Laplace transform of $\cos^2 2t$.

6. Write convolution theorem for Inverse Laplace transform.

7. Write Fourier sine transform of $\dfrac{e^{-ax}}{x}$.

8. Write Fourier cosine transform of $f(t)$.

9. Find z-transform of $\cos h\, n\theta$.

10. Find inverse z-transform of $\dfrac{4z}{z-a}$, $|z| > |a|$

_____

Part-B
T-435
(Analytical/Problem solving questions)
Attempt any five questions.   **5x4=20**

1. Use stirling formula to find Y_{28}, given $y_{20} = 49225, y_{25} = 48316,$
   $y_{30} = 47236, y_{35} = 45926, y_{40} = 44306$.

2. Find the root of $x^4 - x - 10 = 0$ which is nearer to x=2 by Newton Raphson method.

3. Solve $\dfrac{d^2x}{dt^2} + 9x = \cos 2t$, if $x(0) = 1$, $x\left(\dfrac{\pi}{2}\right) = -1$

4. Use Euler's method to solve $\dfrac{dy}{dx} = \dfrac{y^2 - x}{y^2 + x}$ given y=1 at x=0 also.

   Find y for x=0.1, 0.2 and 0.3.

5. Find Laplace transform of $\sin \sqrt{t}$

6. Find the Fourier transform of $e^{-|x|}$ hence show that

   $$\int_0^\infty \frac{x \sin mx}{1 + x^2} \, dx = \frac{\pi e^{-m}}{2}, m > 0$$

7. Find Z-transform of following - (i) $n^2 e^{an}$ (ii) $\sin(3n + 5)$

Part-C
(Descriptive / Analytical / Problem Solving/ Design question)
Attempt any three questions.   **3x10=30**

1. Find value of $\int_1^2 \dfrac{1}{x} dx$ by (i) Simpson's 1/3 rule (ii) Trapezoidal rule

2. Using fourth order Runge-Kutta method with one step, compute y(0.1) to five places of decimal, if

   $y' = 0.31 + 0.25y + 0.3t^2$ and $y = 0.72$ when $t = 0$

3. Apply convolution theorem to evaluate $L^{-1}\left[\dfrac{s^2}{(s^2 + a^2)(s^2 + b^2)}\right]$

4. An infinite string is initially at rest and that the initial displacement is $f(x) \; -\infty < x < \infty$. Determine the displacement y(x,t) of the string.

5. Using Z-transform solve $U_{n+2} - 2U_{n+1} + U_n = 3n + 5$

Total No. of Questions: 22   Total No. of Pages: 02

Roll No. _____   Paper Code
                                                          3E1200

B.Tech. III-Sem (Main & Back) 2025-26
Aeronautical Engineering
3AN1-03 Managerial Economics and Financial Accounting
All Branches
3E1200

Time : 3 Hours   Maximum Marks : 70

**Attempt all ten questions from Part A, five questions out of seven questions
from Part B and three questions out of five questions from Part C.**
Schematic diagrams must be shown wherever necessary. Any data you feel missing
suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated
clearly. Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. _____   2. _____

Part A
(Answer should be given up to 25 words only)

All questions are compulsory   **10x2=20**

Q.1   Explain the meaning and nature of economics.

Q.2   Explain the concept of oligopoly.

Q.3   Define the law of demand.

Q.4   What are the different types of demand?

Q.5   Define cost function and explain its significance.

Q.6   Explain the concept of perfect competition.

Q.7   What is a balance sheet?

Q.8   What is financial ratio analysis?

Q.9   Define production function and explain its significance.

Q.10   Explain the concept of supply and its determinants.

Part B

(Analytical/Problem solving questions)

Attempt any Five questions .   **5x4=20**

Q.1   Differentiate between deductive and inductive methods in economics.

Q.2   Define national income and explain its concepts.

Q.3   What is elasticity of demand? Explain its significance.

Q.4   Discuss the factors influencing the pricing strategies of a firm.

Q.5   What are the different types of costs? Explain.

Q.6   What is monopoly? Explain its characteristics.

Q.7   A company has the following cost structure: Fixed Cost = Rs. 50,000,
        Variable Cost per unit = Rs. 10, Selling Price per unit = Rs. 20. Calcu-
        late the break-even point.

Part C

(Descriptive/Analytical/Problem solving/Design question)

Attempt any Three questions   **10x3=30**

Q.1   Discuss the various tools and techniques used in managerial decision-
        making. Explain any two in detail.

Q.2   Differentiate between 'straight-line depreciation' and 'written-down
        value method' with examples.

Q.3   From the following data, prepare a cash flow statement:
        Opening cash balance : Rs. 20,000, Cash received from customers: Rs.
        1,00,000, Cash paid to suppliers: Rs. 60,000, Operating expenses
        paid : Rs. 15,000

Q.4   Explain the concept of 'capital budgeting' and discuss the various
        methods used to evaluate investment proposals.

Q.5   Discuss the significance of ratio analysis in financial management.
        Calculate any three important ratios from the following data:
        - Current Assets : Rs. 2,00,000
        - Current Liabilities : Rs. 1,00,000
        - Total debt : Rs. 3,00,000
        - Total Equity : Rs. 5,00,000
        - Net Profit : Rs. 1,20,000

B.Tech. III-Sem (Main & Back) January-2026
Aeronautical Engineering
3AN3-03 Engineering Thermodynamics
AE,ME, PI
3E1208

Time : 3 Hours   **Maximum Marks : 70**

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)_____ Steam Table

1._____   2._____

Part-A

(Answer should be given up to 25 words only)

All questions are compulsory   **10x2=20**

T-435

Q. 1   Elaborate the difference between path, process and cycle.

Q. 2   State any four differences between steady and unsteady flow energy equation.

Q. 3   Derive an expression of Clausius inequality.

Q. 4   State the first law of Thermodynamics for a closed system undergoing a cyclic process.

Q. 5   State the Kelvin-Planck and Clausius statement of second law of thermodynamics.   T-435

Q. 6   Define Entropy and prove that it is a property of the system.

Q. 7   Explain the concept of available energy and unavailable energy.

Q. 8   Steam enters an engine at a pressure of 10 bar and 400°C. It is exhausted at 0.2 bar. The steam at exhaust is 0.9 dry.

Find : (i) Drop in enthalpy (ii) Drop in entropy.

Q. 9   A saturated steam has entropy of 6/76 kJ/kgK. What are its pressure, temperature and specific volume?

Q.10   State and explain Dalton's law of partial pressure and Gibb's law.

Part B

(Analytical/Problem solving questions)

Attempt any Five questions.   **5x4=20**

Q.1   A gas initially at 100KPa and 6000cm^3. The final volume is 2000cm^3. Determine the moving boundary work for each of the following processes. (i) P is inversely proportional to V (ii) PV^2 = constant (iii) P is inversely proportional to V.

Q.2   One kg of certain fluid is contained in system at a pressure of 10 bar. The fluid is allowed to expand reversibly untill the volume becomes twice the initial volume according to the law PV^2=C. The fluid is then cooled reversibly at constant pressure untill the piston regains its original position. Heat is then supplied with the piston firmly locked in position untill the pressure rises to the original value. Calculate the net work done by the fluid for an initial volume of 0.05m^3.

Q.3   Air initially at 60 KPa pressure, 800K temperature and occupying a volume of 0.1 m^3 is compressed isothermally until the volume is halved(half) and after that. it goes further compression at constant pressure till the volume is halved again. Sketch the process on a P-V diagram and make calculations for total work done and total heat interaction for the processes. Assume ideal gas behavior. Take Cp=1.005kJ/kgK and R=287 J/kgK.

Q.4. Derive Steady Flow Energy Equation for an open system using first law of Thermodynamics. T-435

Q.5 Represent the Carnot heat engine on a p-v diagram and discus all the processes derive an expression for the efficiency of the Carnot Cycle.

Q.6 Air at 5×10^5 N/m^2 and 500^{0}C expands in a turbine to 1×10^5 N/m^2 and 290^{0}C. During expansion 12 kJ/kg of heat is lost to the surroundings which is at 0.98×10^5 N/m^2 and 20^{0}C. Neglecting changes in kinetic energy and potential energy. determine per kg of air.

(a) The decrease in availability. (b) The maximum work required and

(c) The irreversibility

Q.7 Elaborate reheat and regenerative cycle with characteristics diagrams.

Part C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any three questions.   **3x10=30**

Q.1 Define the following with examples.

(i) open. closed and isolated system.

(ii) all four equilibrium T-435

(iii) thermodynamic processes.

Q.2 Derive all the Maxwell's relations considering suitable diagram and nomenclature.

Q.3 A mixture of gas contains 1 kg CO_2 and 1.5 kg of N_2. The pressure and temperature of the mixture are 3.5 bar and 27^{0}C. Determine for the mixture:

(i) The mass fraction and mole fraction of each constituent gases,

(ii) Molecular weight of the mixture,

(iii)   The partial pressures,

(iv)   Characteristic gas constant.

(v)   Volume fractions.

Q.4   (a)   Define dryness fraction of the steam. What are methods used to measure dryness fraction with neat sketch explain any one method,

(b)   Calculate the internal energy per kg of superheated steam at pressure of 10 bar and a temperature of 300^0C. Also find the change in internal energy if this steam is expanded to 1.4 bar and dryness fraction 0.8.

Q.5   Elaborate the Dual cycle and Brayton cycle with P - v and T-s diagrams and derive the expression of work done.

Total No. of Questions: 22   Total No. of Pages: 02

Roll No. _____   Paper Code
                                             3E1207

B.Tech. III-Sem (Main & Back) January-2026
Automobile Engineering
3AE3-04 Engineering Mechanics
AE,ME, PI
3E1207

Time : 3 Hours   **Maximum Marks : 70**

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1_____   2_____

Part A

(Answer should be given up to 25 words only)

All questions are compulsory   **10x2=20**

Q.1   State principle of virtual work.

Q.2   Define Lami's Theorem.

Q.3   What is a Free Body Diagram (FBD)?

Q.4   What is belt slip ?

Q.5   Define virtual work.

Q.6   State D' Alembert's principle.

Q.7   What is radius of gyration ?

Q.8   What is angle of repose ?

Q.9   Define efficiency of a lifting machine.

Q.10   Define perfect frame (truss).

Part B

(Analytical / Problem solving questions)

Attempt any five questions. T-435   **5x4=20**

Q.1   Determine the reactions at supports of a simply supported beam carrying a 10 kN point load at the centre.

Q.2   A body of mass 10 kg is moving with velocity 6 m/s. A force of 20 N
       acts on it for 4 seconds. Find change in momentum and final velocity.

Q.3   A truss joint has three forces meeting. Two forces are 4 kN and 6 kN
       acting at 60^0 to each other. Find the third force for equilibrium.

Q.4   A block of weight 100 N rests on a rough horizontal plane. If $\mu = 0.3$,
       find the horizontal force required to just move it. ₜ₋₄₃₅

Q.5   A 2-kg ball moving at 12m/s strikes another 3-kg ball at rest After impact,
       the 2-kg ball moves backwards with 4m/s. Find the coefficient of restitution.

Q.6   A 100 N ladder rests at 70^0 on a smooth wall. Find reaction at wall and
       ground.

Q.7   A wedge of angle 10^0 is used to lift a load of **800 N**. If $\mu =0.2$, determine
       the total effort required.

Part-C

(Descriptive / Analytical / Problem Solving/ Design question)
Attempt any three questions.   **3x10=30**

Q.1   Calculate MOI of an I-Section. Draw composite section and show
       steps.

Q.2   A projectile is fired at 55^0 at 35 m/s. Determine maximum height, time
       of flight, and range.

Q.3   State and explain the principle of impulse- momentum. A 3 kg ball
       moving at 15 m/s strikes another 5 kg ball at rest. After impact, first ball
       moves at 5 m/s . Find coefficient of restitution. ₜ₋₄₃₅

Q.4   Explain Varignon's theorem. A force system produces moments 50 N-m
       at A and 30 N-m B. Find resultant moment and location.

Q.5   Explain belt friction theory and derive $T_1/T_2 = e^{\mu\theta}$

Total No. of Questions: 22   Total No. of Pages: 02

Roll No. _____   Paper Code
                                                      3E1209

B.Tech. III-Sem (Main & Back) January-2026
Automobile Engineering
3AE4-06 Materials Science and Engineering
AE,ME
3E1209

Time : 3 Hours   Maximum Marks : 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1.NA_____   2. NA_____

Part-A

(Answer should be given up to 25 words only)

All questions are compulsory   10x2=20

Q. 1   What are Nano materials?

Q.2   Discuss the general effects of tempering the steel.

Q.3   Discuss mechanical properties of materials.

Q.4   What is Elastic deformation?

Q.5   Define Miller Indices.

Q.6   Define Allotropy. Give some examples.

Q.7   What do you understand by phase diagram?

Q.8   What is Re-Crystallization"?

Q.9   What do you understand by strain hardening?

Q.10   What is solid solution?

Part B

(Analytical/Problem solving questions)

Attempt any Five questions.   **5x4=20**

Q.1   Describe the nature of bonding of atoms in ceramics materials and discuss the main features of the ceramic crystal structure.

T-435

Q.2   What is contribution of light metal and their alloys for solving the problems related to corrosion? Give a few examples.

Q.3   Explain slip and twinning mechanisms with neat sketches.

Q.4.   With neat sketches, explain crystal lattice of BCC and FCC.

Q.5   Discuss the properties and applications of Al2O3, Si3N4, Sic and PS.

Q.6   Explain various properties and applications of Nano structured materials.

Q.7   Write a short note on urea and phenol formaldehyde.

Part C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions   **3x10=30**

Q. 1   What are properties and engineering applications of PMMA, ABS, PVC, PA and PTFE?

Q.2   Draw neat, labelled Iron carbon equilibrium diagram. Explain invariant reactions occur in this diagram.

T-435

Q.3   Explain the effects of addition of Si, Cr, Mo, V and W alloying elements on the properties of steel.

Q.4   Explain Rockwell hardness testing method with sketch.

Q.5   Explain various properties and applications of Nano structured materials.

Total No. of Questions: 22   Total No. of Pages: 04

Roll No. _____   Paper Code
                                                    3E1210

B.Tech. III-Sem (Main & Back) January-2026
Aeronautical Engineering
3AN4-06 Mechanics of Solids
AE,ME,PI
3E1210

Time : 3 Hours   Maximum Marks : 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL_____   2. NIL_____

Part-A
(Answer should be given up to 25 words only)

All questions are compulsory   10x2=20

Q1   What do you mean by "anisotropic materials"?

Q2   How many static equilibrium equations required for a body?

Q3   Bending moment diagram is a rectangle. Comment on shear force diagram for the same.

Q4   What do you mean by "Section Modulus"?

Q5   What do you mean by "Principal Strains"?

Q6   Give a statement of distortion energy theory.

Q7   Define torsional stiffness.

Q8   Define strut.

Q9   Write bending equation .

Q10   What do you mean by "Pressure Vessels"?


Part-B

(Analytical/Problem solving questions)

Attempt any five questions. 5x4=20

Q1 A thin cylinder is subjected to the internal pressure 5MPa (gauge). The diameter of the cylinder is 500mm and thickness is 20mm. Calculate the hoopstress and longitudinal stress induced in the material of the cylinder.
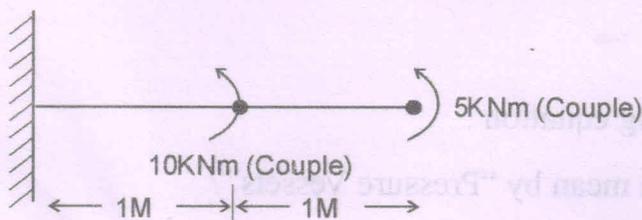
Q2 Calculate the torsional shear stress at $X_1 - X_1$ and $X_2 - X_2$ as shown in figure.
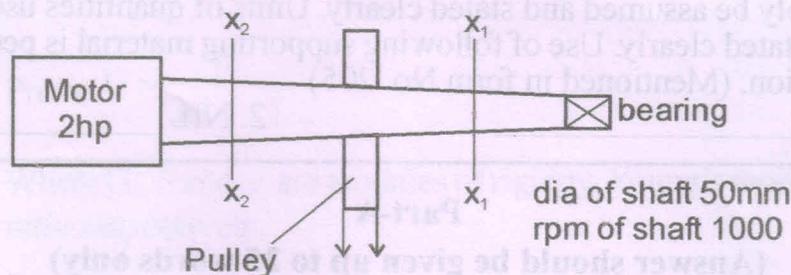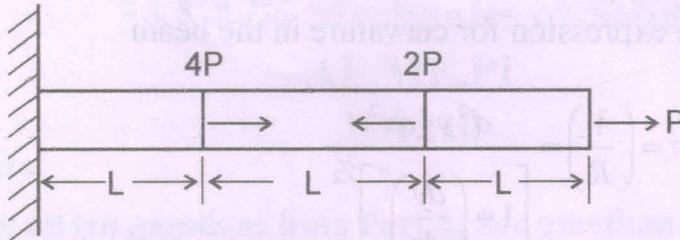

Q3 A point is subjected to following stresses, calculate the principal stresses.
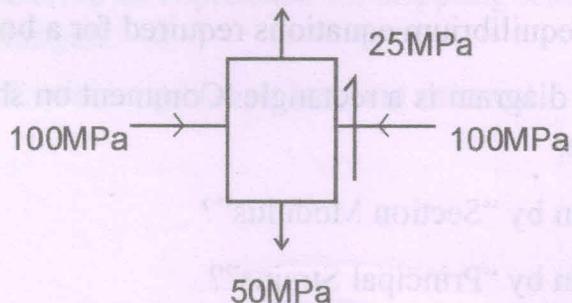
Q4 Draw shear force and bending moment diagram of following.

Q5   Derive an expression for strain energy stored as shown in figure.

Cross sectional area is A and
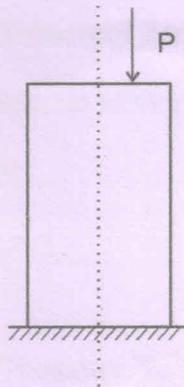Young's Modules is E.

Q6   A point is subjected to two normal stresses 100MPa & 30 MPa as shown in fig . If the one of the principal stress is 60MPa calculate the other value of principal stess.
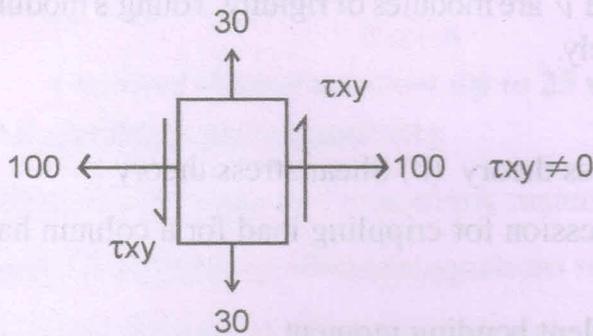
Q7   Write the types of stresses induced in the following structural member.

Part-C
(Descriptive / Analytical / Problem Solving / Design questions)

Attempt any Three questions. T-435   **3x10=30**

Q1   Prove the expression for curvature in the beam

$$curvature = \left(\frac{1}{R}\right) = \frac{d^2y/dx^2}{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{3/2}}$$

All notations have their usual meaning.

Q2   Prove $G = \dfrac{E}{2(1+v)}$

Where G , E and v are modules of rigidity, Young's modules and Poission ratio respectively.

Q3   Explain :-

(a) Normal stress theory (b) Shear stress theory

Q4   Derive an expression for crippling load for a column having both ends hinged. T-435

Q5   Explain equivalent bending moment.

B.Tech.III Sem (Old/Mercy Back) Exam 2026
PCC Automobile Engineering
3AE4-07 Mechanics of Solids
3E1119
AE,ME

Time: 3 Hours   **Maximum Marks: 160**

Attempt all ten questions from Part A, five question out of seven from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

    1. _____   2. _____

Part A

(Answer should be given up to 25 words only)

All questions are compulsory.   **10x3=30**

Q.1.   Define modulus of rigidity and modulus of elasticity

Q.2.   Define stress and strain and their units.

Q.3.   State Hooke's Law

Q.4.   Define the terms Factor of Safety and Poisson's ratio.

Q.5.   What is buckling? Also define torsional rigidity.

Q.6.   At a point, $\sigma_x = 40$ MPa, $\sigma_y = 20$ MPa, $\tau = 10$ MPa. Find principal stresses.

Q.7.   A circular rod of diameter 20 mm and 500 mm long is subjected to a tensile force of 45 KN. the modulus of elasticity for the material is 2.1×10^5 N/mm2. Find the stress, strain.

Q.8.   What is neutral layer and neutral axis in bending?

Q.9.   Find max deflection for cantilever of length 1 m with 100 N at free end. E = 200 GPa and $I = 4 \times 10^6$ mm^4

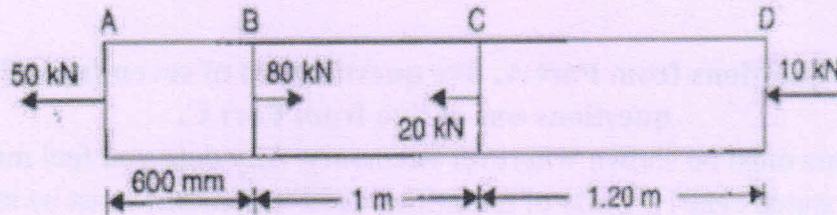Q.10.   A cantilever beam of 2 m carries a point load of 100 N at free end. Find maximum bending moment.

Part B
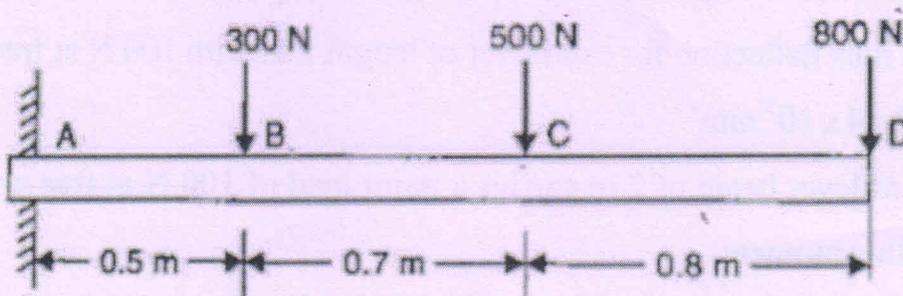
(Analytical/Problem solving questions)

Attempt any Five questions .   **5x10=50**

Q.1   Find the total elongation of the brass bar. Take $E = 1.05 \times 10^5$ N/mm^2 . A brass bar, having cross-sectional area of 1000 mm^2 , is subjected to axial forces as shown in below figure.

Q.2   Draw stress-strain diagram with all salient points on it for ductile material and explain the term ultimate stress.

Q.3   A material is subjected to stresses of 100 MPa (tensile) on one plane and 50 MPa (compressive) on a plane perpendicular to it. A shear stress of 30 MPa acts on these planes. Find the principal stresses.

Q.4   Derive the bending equation $\dfrac{M}{I} = \dfrac{\sigma}{y} = \dfrac{E}{R}$. State its assumptions.

Q.5   (a)   Explain the concept of slenderness ratio and its effect on the strength of columns.

        (b)   Derive Euler's formula for the buckling load of a long column with both ends pinned.

Q.6   Derive the expression for the angle of twist in a solid circular shaft. Also mention the assumptions made in deriving the torsion equation.

Q.7   A cantilever beam of length 2 m carries the point loads as shown in below figure. Draw the shear force diagrams for the cantilever beam.
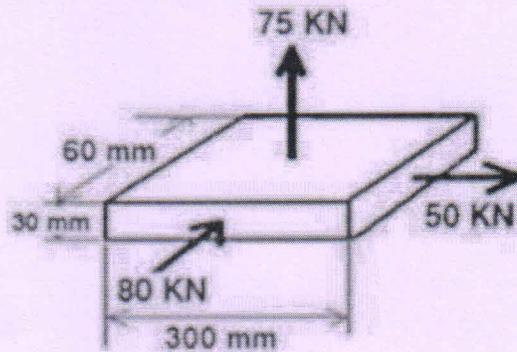
Part C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any four questions.   **4x20=80**

Q. 1   A steel plate 300mm long, 60mm wide and 30mm deep is acted upon by the forces shown in figure. Determine the change in volume. Take E = 200 KN/mm2 and Poisson's ratio = 0.3.

Q. 2.   A material is subjected to stresses of 120 MPa (tensile) on one plane and 60 Mpa (compressive) on a plane perpendicular to it. A shear stress of 40 MPa acts on these planes. Determine the principal stresses and maximum shear stress using Mohr's circle or analytical way. Also, find the orientation of the principal planes.

Q. 3.   A hollow circular shaft transmits 200 kW power at 200 rpm. The internal diameter is 0.6 times the external diameter and the maximum shear stress is 60 Mpa. Determine:

   (i)   The external and internal diameters of the shaft.

   (ii) The angle of twist per meter length Take G = 80 GPa.

Q. 4. (a) Explain Euler's and Rankine's theories for column buckling

   (b) A steel bar 1.5 m long and 20 mm diameter is subjected to an axial tensile load of 30 kN. Find (i) Stress, (ii) Strain, and (iii) Elongation. Take E = 200 GPa; Poisson's ratio = 0.3.

Q. 5.   Derive an expression for the deflection at the free end of a cantilever carrying a point load at the free end.