[05 BENG – 2101]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Electronics and Communication Engineering

MATHEMATICS — IV

(Common for B.Tech., Civil, Mechanical, ECE, EEE, Instrumentation and Chemical Engineering)

(Effective from the admitted batch of 2015–2016)

Time : Three hours Maximum : 70 marks

Answer ALL questions in Part A and FOUR questions from Part B.

All questions carry equal marks.

Questions of Part A must be answered at One place only.

PART — A

1. (a) If $\nabla \cdot \overline{F} = 3$ then find $\int_S \overline{F} \cdot \overline{n}\, dS$ where S is the surface of a unit sphere.

(b) The directional derivative of $f = ax + by + cz$ at (1, 1, 1) has maximum magnitude 4 in the direction parallel to x-axis. Then find a, b, c.

(c) Form the partial differential equation by eliminating the arbitrary function from $z = e^{my} \cdot \phi(x - y)$.

(d) Solve $xp - yq = y^2 - x^2$.

(e) Obtain the two dimensional steady state heat flow equation in polar coordinates.

(f) Find the finite Fourier sine transform of $f(x) = 2x, 0 < x < 4$.

(g) Find the Fourier transform of $e^{-2(x-3)^2}$.

PART — B

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

(b) Solve $xp + q = p^2$.

3. (a) Find the complete solution of the equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x\, \partial y} - 6\frac{\partial^2 z}{\partial y^2} = y \cos x$.

(b) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x\, \partial y} + \frac{\partial z}{\partial y} = x^2 + y^2$.

4. (a) If $f = (x^2 + y^2 + z^2)^{-n}$ then :

(i) determine n if div grad $f = 0$

(ii) show that div $(\text{grad}\, r^n) = n(n+1)r^{n-2}$ where $r^2 = x^2 + y^2 + z^2$.

(b) Show that :

(i) $\nabla \times (\nabla \times \overline{F}) = \nabla(\nabla \cdot \overline{F}) - \nabla^2 \overline{F}$ and

(ii) $\nabla \cdot (\overline{F} \times \overline{G}) = \overline{G} \cdot (\nabla \times \overline{F}) - \overline{F} \cdot (\nabla \times \overline{G})$.

5. (a) State Green's theorem and apply it to evaluate $\int_C [(2x^2 - y^2)dx + (x^2 + y^2)dy]$

where C is the boundary of the area enclosed by the x-axis and the upper half of the circle $x^2 + y^2 = a^2$.

(b) Evaluate $\int_S \overline{F} \cdot d\overline{S}$ where $\overline{F} = 4x\bar{i} - 2y^2\bar{j} + z^2\bar{k}$

and S is the surface bounding the region $x^2 + y^2 = 4$, $z = 0$ and $z = 3$.

6. (a) Show that cylindrical coordinate system is orthogonal. Evaluate $\nabla\phi = xyz$ in cylindrical coordinates.

(b) Using D'Alemberts method, find the deflection of a vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $f(x) = a(x - x^2)$.

7. (a) Find the Fourier transform of $f(x) = \frac{1}{\sqrt{|x|}}$.

(b) Establish the Parseval's identify for Fourier transforms. Using this identify evaluate $\int_0^\infty \frac{t^2}{(4+t^2)(9+t^2)}\,dt$.

8. (a) Solve the integral equation $\int_0^\infty f(x)\cos\alpha x\,dx = e^{-\alpha}$ using the Fourier transforms.

(b) Using finite Fourier transform, solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, given $u(0,t) = 0$, $u(4,t) = 0$, $u(x,0) = 2x$ where $0 < x < 4, t > 0$.

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[01 BENG – 2101]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Civil Engineering

MECHANICS OF SOLIDS

(Effective from the admitted batch of 2015–2016)

Time : Three hours Maximum : 70 marks

Answer question number 1 compulsory.

Answer any FOUR questions from the remaining.

1. (a) Define modulus of rigidity.

   (b) Define Hookes law.

   (c) Define Hoop stress.

   (d) Define crippling load.

   (e) List out any four assumptions made in Euler's theory.

   (f) Define point of contraflexure.

   (g) Define Polar modulus.

2. (a) Derive the relation between young's modulus and bulk modulus.

(b) The following data is noted when a mild steel specimen tested in the laboratory.

(i) Diameter of the specimen = 25 mm

(ii) Length of the specimen = 300 mm

(iii) Extension under a load of 15 kN = 0.045 mm

(iv) Load at yield point = 127.65 kN

(v) Maximum load = 208.60 kN

(vi) Length of the specimen after failure = 375 mm

(vii) Neck diameter = 17.75 mm

Determine the following (1) Young's modulus (2) Yield point (3) Ultimate stress (4) percentage of elongation (5) percentage reduction in area (6) Safe stress adopting a factor of safety of 2.

3. (a) A simply supported beam of 10 m span is loaded as shown in Figure 1. Draw the B.M.D. and S.F.D. indicating principal values.

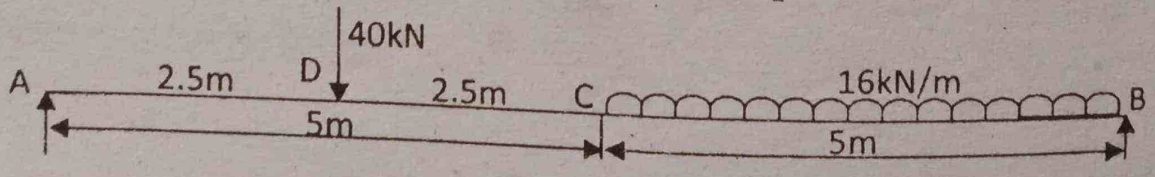

Figure 1

(b) A simply supported beam of span L is loaded with a triangular load with intensity zero at one end to w per unit length at the other end. Draw the B.M.D. and S.F.D. indicating principal values.

4. (a) A simply supported beam of span 1 carrying a uniformly distributed load of w per unit run over the whole span. Estimate the deflection at center and slope at ends.

(b) A cantilever of length 2 meters carries a uniformly distributed load of 2500 N/m for a length of 1.25 meters from the fixed end and a point load of 1000 N at the free end. If the section is rectangular 120 mm side and 240 mm deep, find the deflection at the free end. Take $E = 10000\ N/mm^2$.

5. (a) At a certain point in a strained material the intensities of normal stresses on two planes at right angles to each other are $30\ N/mm^2$ and $20\ N/mm^2$ both tensile. They are accompanied by shear stress of $20\ N/mm^2$. Find the principal planes and the principal stresses. Find also the maximum shear stress.

(b) A steel shaft transmits 105 kW at 160 rpm. If the shaft is 100 mm in diameter, find the torque on the shaft and the maximum shear stress induced. Find also the twist of the shaft in a length of 6 m. Consider Modulus of rigidity $= 8 \times 10^4\ N/mm^2$.

6. A cylindrical shell 1 m long, 180 mm internal diameter, thickness of metal 8 mm is filled with a fluid at atmospheric pressure. If an additional 20000 mm^3 of the fluid is pumped in to the cylinder, find the pressure exerted by the fluid on the wall of the cylinder. Find also the hoop stress induced. Take $E = 2 \times 10^5$ N/mm^2 and Poisson's ratio is 0.3.

7. A simply supported beam of length 6 m carries a triangular load whose intensity varies uniformly from zero at the left end to 60 kN/m at the right end. It has one support at 1.5 m from the left and the other support at the right end. Draw the B.M.D. and S.F.D. by indicating principal values.

8. Find the Euler's critical load for a hollow cylindrical cast iron column 200 mm external diameter and 25 mm thick, if it is 6 meter long and hinged at both ends. Consider $E = 8 \times 10^4$ N/mm^2. Compare Euler's critical load with the Rankine's critical load taking $f_c = 550\,N/mm^2$ and $\alpha = 1/(1600)$. For what length of the column would the critical loads by Euler's and Rankine's formula be equal?

[01 BENG – 2104]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Civil Engineering

FLUID MECHANICS – I

(Effective from the admitted batch of 2015–2016)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) At a point in a fluid the shear stress is 15 N/m^2 and the velocity gradient is 100 m/s/m. What is the viscosity of fluid in poises?

   (b) What is difference between Gauge pressure and total pressure?

   (c) What is the practical significance of metacentric height?

   (d) What is difference between Stream line and Streak line?

(e) What is Vorticity? State its significance.

(f) What is Energy correction factor?

(g) State the laws of Friction.

2. (a) What is Pascal's law? Explain Newton's law of Viscosity.

(b) A plate having an area of 0.8 m^2 is sliding down the inclined plane at 30° to the horizontal with a velocity of 0.36 m/s. There is a cushion of fluid thick between the plane and plate. Find the viscosity of the fluid if the weight of the plate is 280 N.

3. (a) What is Buoyancy? Explain the forces acting on radial crest gates and Lock gates.

(b) Each gate of a lock is 6 m high and is supported by two hinges placed at the top and bottom of the gate. When the gates are closed, they make an angle of 120°. The width of the lock is 5 m, of the water levels are 4 m and 2 m on upstream and downstream sides respectively, find

(i) Resultant water pressure on each gate and

(ii) Reaction at the hinges.

4. (a) Define and explain briefly the following :

(i) velocity

(ii) stream function.

(b) If $\phi = 3xy$, find x and y components of velocity at (1, 3) and (3, 3). Determine the discharge passing between streamlines passing through these points.

5. (a) What is Bernoulli's equation? State its assumptions and limitations.

(b) A 200 mm × 100 mm venturimeter is provided in a vertical pipe carrying water, flowing in the upward directions. A differential mercury manometer connected to the inlet and throat gives a reading of 220 mm. Find the rate of flow. Assume Cd = 0.98.

6. (a) Derive Hagen-Poiseuille equation.

(b) Find the discharge through a trapezoidal notch which is 1.2 m wide at the top and 0.50 m at the bottom and is 0.4 m in height. The head of water on the notch is 0.3 m cd for rectangular portion = 0.62, while for triangular portion = 0.60.

7. The pipeline of 600 mm diameter is 1.5 km long. To increase the discharge another line of the same diameter is introduced parallel to the first in the second half of the length. If f = 0.01 and head at inlet is 300 mm. Calculate the increase in discharge.

8. (a) What is momentum correction factor? State its significance.

(b) A 0.225 m diameter open circular cylinder is 1.5 m long and contains water upto a height of 1.05 m. Estimate the speed at which the cylinder may be rotated about its vertical axis so that the axial depth becomes zero.

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[01 BENG– 2102]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Civil Engineering

BUILDING MATERIALS AND BUILDING CONSTRUCTION

(Effective from the admitted batch of 2015–2016)

Time : Three hours Maximum : 70 marks

Question No.1 is compulsory.

Answer any FOUR from the remaining.

ALL questions carry equal marks.

1. Answer the following: (7 × 2 = 14)

   (a) Mention one application of burnt, unburnt and over burnt bricks?

   (b) What are batten boards and particle boards?

   (c) What is painting? Mention any two defects of painting?

   (d) How strap footing is different from mat footing?

(e) What are FAL-G blocks. What are its advantages?

(f) What are the advantages of fiber glass roofs?

(g) Mention Bogue's compounds?

2. (a) Bring out important differentiation between different classes of bricks?

(b) What is glazing of tiles? Explain.

3. (a) Discuss various defects in wood.

(b) Explain manufacturing process of ply wood.

4. (a) What is distempering? What are its properties?

(b) What is bitumen? What are vparious types of bitumen?

5. (a) Write a short note on mat footing and inverted arch foundations.

(b) Pictorially represent Monk bond and 2 brick wall in English bond.

6. (a) Write a detailed note on Asbestos cement roofing.

(b) Describe queen post truss used for roofs.

7. (a) Discuss briefly Glazed and Flush shutters.

(b) Sketch a doglegged stair case. Mention its parts.

8. (a) Mention any eight types of cements? Briefly discuss any two of them.

(b) Describe step wise test procedure to evaluate compressive strength of concrete.

[01 BENG – 2103]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Civil Engineering

SURVEYING – I

(Effective from the admitted batch of 2015–2016)

Time : Three hours Maximum : 70 marks

Question No.1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) Name the various types of chains used in surveying.

   (b) What is Azimuth?

   (c) Define Arbitrary Meridian.

   (d) What are the advantages of plane table surveying?

   (e) Define curvature correction.

   (f) What is the use of planimeter?

   (g) What are the uses of contour maps?

2. (a) Explain the various instruments used in chaining with suitable sketches.

(b) What are the problems in chainings and explain the remedial measures?

3. (a) Explain the theory of magnetic campus and local attraction with a neat sketch.

(b) Describe the method of fast needle in Traverk surveying.

4. (a) What is Resection and explain the different types of Resections?

(b) Explain the working operations involved in plane Table surveying.

5. (a) The following staff readings were recorded for a certain work of levelling.

3.460, 2.734, 2.161, 2.405, 3.512, 1.907, 0.720, 1.156, 3.210, 2.146, 1.786 and 2.768.

The first reading was taken on B.M "A" and the level was shifted after the 4th and 8th readings. Rule out a page of level book, enter the readings and find out RL's of all points by both method if R.L of B.M was given as 249.500. If the distance between the B.M and the last station is 1500m, what is the average slope between these points.

(b) What are the various types of errors that can be occured during levelling?

6. Explain the uses and adjustments of the following with the help of neat sketches.

   (a) Optical square

   (b) Ceylon Ghat Tracer

7. (a) Explain the Direct method of locating contours.

   (b) Explain the usage of CAD in Countours Mapping.

8. Explain the following

   (a) Chain correction

   (b) Magnetic Declination

   (c) Traversing

   (d) Conventional signs with examples.

[01 BENG - 2105]

II/IV B.Tech DEGREE EXAMINATION.

First Semester

Civil Engineering

ENVIRONMENTAL STUDIES

(Effective from the admitted batch of 2015 – 2016)

Time : Three hours Maximum : 70 marks

Question No.1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) Marine pollution (7 × 2 = 14)

(b) Global warming

(c) Soil erosion

(d) Renewable energy

(e) Mention few environmental movements

(f) Hot spots

(g) Kolleru lake

2. (a) What are the Effects of modern agriculture. (2 × 7 = 14)

(b) Discuss about Water logging and salinity.

3. (a) Write the Impact of mining on forest and tribal people. (2 × 7 = 14)

(b) Give a brief account of Impact of energy use on environment.

4. Write in detail about the biogeographically classification of India. (14)

5. (a) Write in detail about the vermiculture. (2 × 7 = 14)

(b) What are factors effecting Ozone depletion.

6. (a) Discuss in detail about the water shed management. (2 ×7 =14)

(b) Give an account of sanitation and public health

7. Discuss in detail about the environmental impact assessment. (14)

8. (a) Write about the wild life protection act (2 × 7 =14)

(b) Give a brief account on Impact of fluorosis in Andhra Pradesh.

[01 BENG – 2106]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Civil Engineering

ENGINEERING MECHANICS

(Effective from the admitted batch of 2015-2016)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) What is difference between couple and moment?

   (b) Give practical example for resultant of a parallel, and non coplanar force.

   (c) State first theorem of pappus.

   (d) What is Radius of gyration of areas? State its use.

   (e) State the principle of virtual work.

(f) What is impulse? State principle of angular momentum.

(g) State the equations of equilibrium of a rigid body experiencing a planar motion.

2. (a) Show that a couple can be transposed in its plane without changing in action on a body.

(b) For the system of forces shown in figure determine the magnitudes of P and Q such that the resultant of the system passes through A and B.

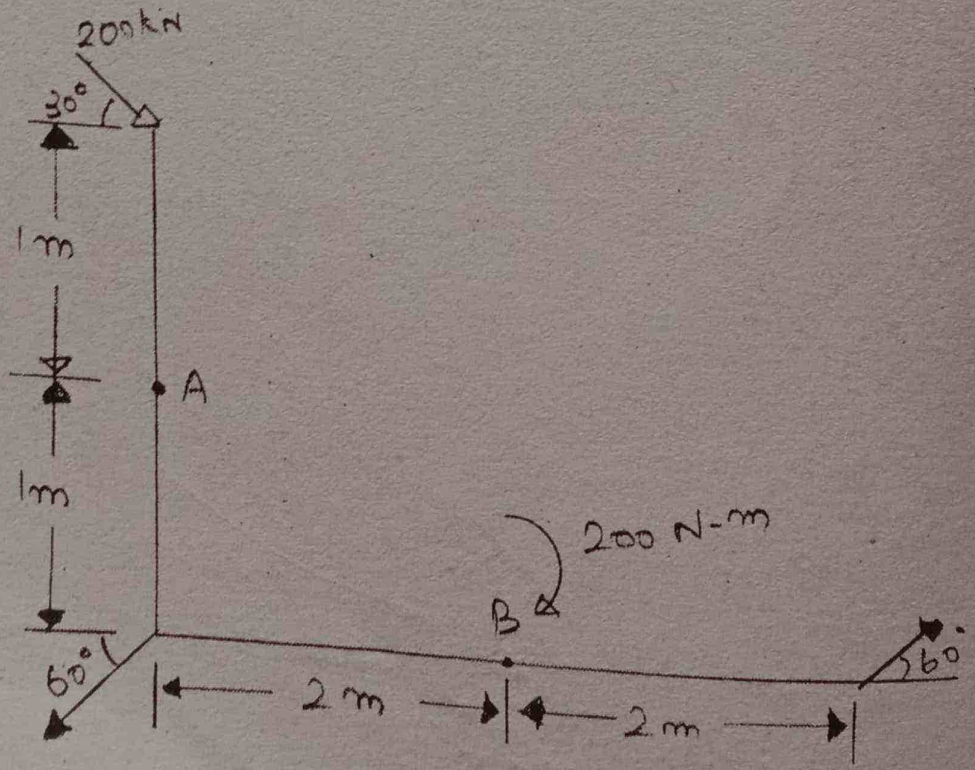

Fig. 1

3. If a force acting at 45° to the horizontal is just sufficient to move the roller over the block as shown in Fig. 2, find the magnitude and direction of P. When it is minimum, and also find the corresponding value of the reaction? The radius of roller is 800 mm and weight of Roller is 1000 N.

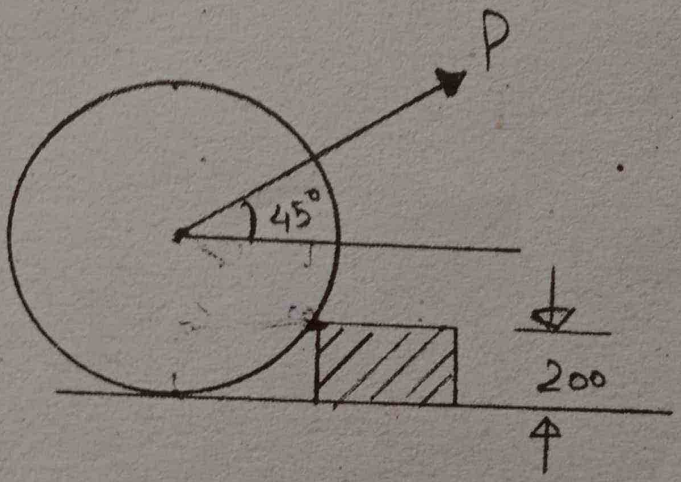

Fig. 2

4. A truss of span 10 m is loaded as shown in Fig. 3 Find the reactions and forces in CD, AC and ED members.

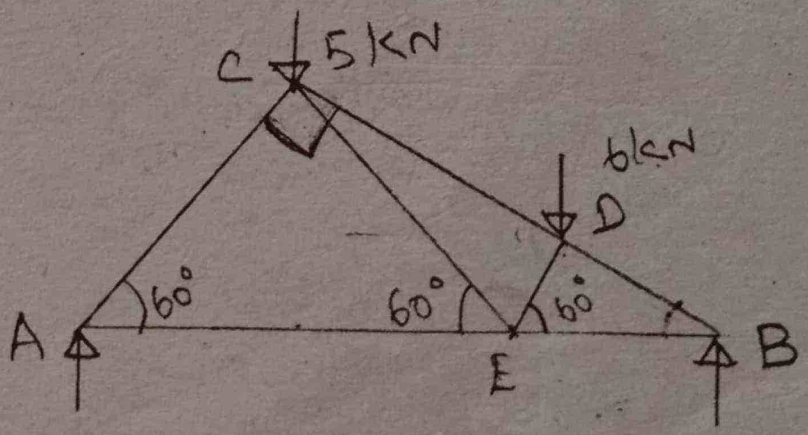

Fig. 3

5. Locate the centroid and determine the M.I of the C section about centroidal x–axis and centroidal y–axis.

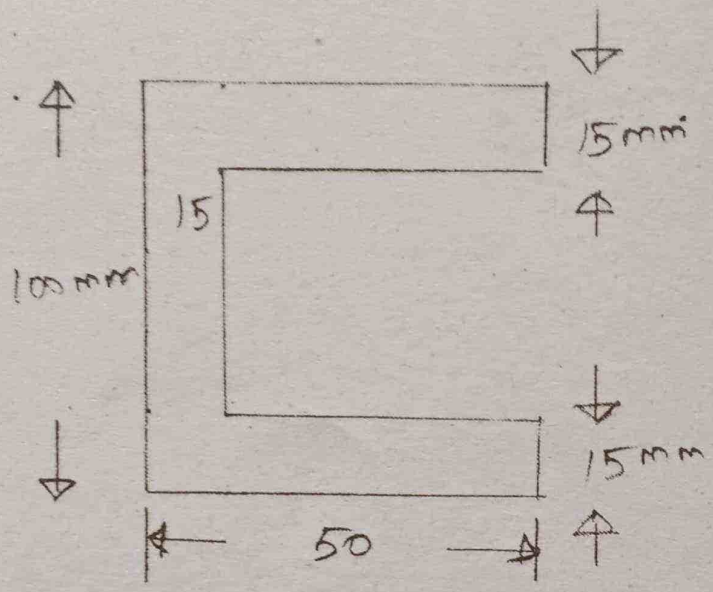

Fig. 4

6. A ladder 8 m long weighting 200 N is restin g against a rough vertical wall as shown in Fig. 5. A man of 720 N climbs the ladder at M. At what vertical position will be induced slipping? Take u for all surface of 0.25.

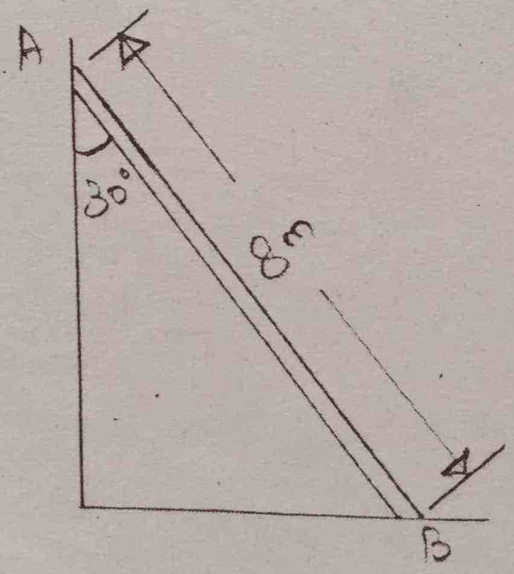

Fig. 5

7. (a) When a motor cyclist is riding west at 40 km/h, he finds the rain meeting him at an angle of 45° with vertical. When he rides at 24 km/h he finds the rain at an angle of 30° with the vertical. What is the actual velocity of rain?

(b) A 700 N man stands in a elevator. The elevator accelerates upward with a constant value of 2.4 m/s (i) Find the apparent weight of the person during acceleration (ii) If the elevator cage weights 5700 N, find the cable tension during the upward acceleration of the elevator (iii) what is the value of the acceleration for which the man will appear to be weightless?

8. (a) A fly wheel weighing 50 kN and having radius of gyration 1 m loses its speed from 400 rpm to 280 rpm in 2 minutes. Calculate (i) the retarding torque acting on it (ii) change in its kinetic energy during the above period (iii) change in its angular momentum during the same period.

(b) A glass marble whose weight is 0.2 N falls from a height of 10 m and rebounds to a force height of 8 metres. Find the impulse and the average for a between marble and floor if the time during which they are in contact is $\frac{1}{10}$ of a second.
