

**Code: 5G511**

I B.Tech. I Semester Supplementary Examinations August 2021

**Engineering Mechanics-Statics**

( Common to CE &amp; ME )

Max. Marks: 70

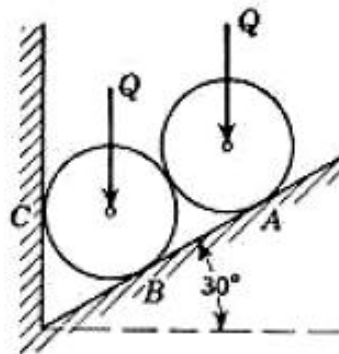
Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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**UNIT-I**

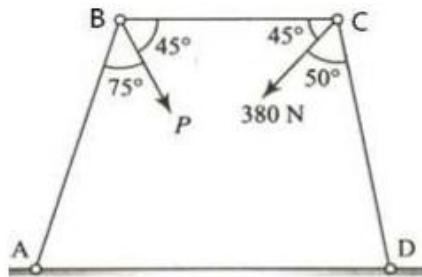
1. Two identical rollers, each of weight 100 N, are supported by an inclined plane and a vertical wall as shown in fig. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C.



14M

**OR**

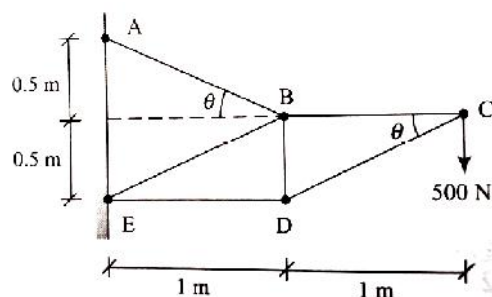
2. In the four-bar mechanism ABCD, as shown in fig. below, determine the force P for equilibrium.



14M

**UNIT-II**

3. Compute the axial forces in the members of the plane truss as shown in fig.



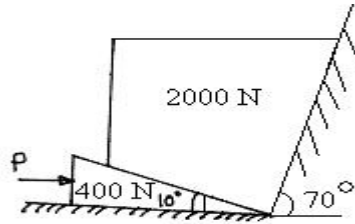
14M

**OR**

4. a) What is a frame? State the difference between a perfect frame and an imperfect frame. 4M
- b) A simply supported beam AB is subjected to a distributed load increasing from 1500 N/m to 4500 N/m from end A to end B respectively. The span AB = 6 m. Determine the reactions at the supports. 10M

## UNIT-III

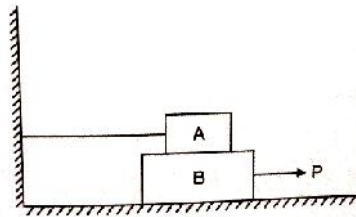
5. Determine the horizontal force  $P$  to start the 400 N wedge moving the right. The angle of friction is  $20^\circ$  to all contact surfaces.



14M

OR

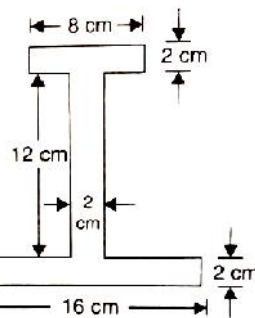
6. a) State the laws of friction. 4M  
 b) Block-A weighing 1000N rests over block B which weighs 2000N as shown in fig. Block A is tied to wall with a horizontal string. If the coefficient of friction between blocks A and B is 0.25 and between B and floor is  $1/3$ , what should be the value of  $P$  to move the block B.



10M

## UNIT-IV

7. Find the centroid of the I-section shown in fig.



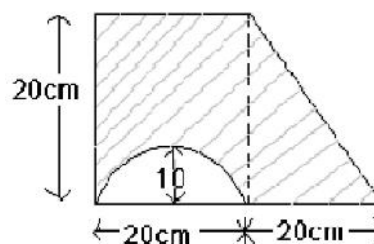
14M

OR

8. In a steel cylinder with a 20cm base diameter and a 30cm height, a vertical hole of 4cm base diameter is drilled upto half the depth from the top and the portion is filled with lead, whose density is  $11370 \text{ kg/m}^3$ . Determine the centre of mass of the composite body. Take the density of steel as  $7850 \text{ kg/m}^3$ . 14M

## UNIT-V

9. Find the moment of inertia for the in the figure. 4 Find the moment of inertia for the hatched area parallel to centroidal  $x$  - axis.



14M

OR

10. A brass cone with base diameter of 400 mm and height of 225 mm is placed on a vertical aluminium cylinder of height 300 mm and diameter 400 mm. Density of brass =  $85 \text{ kN/m}^3$  and density of aluminium =  $25.6 \text{ kN/m}^3$ . Determine the mass moment of inertia of the composite body about the vertical geometrical axis. 14M

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**R-15**

**Code: 5GC12**

I B.Tech. I Semester Supplementary Examinations August 2021

**Engineering Chemistry**  
( Common to CE, ME, IT & CSE )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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**UNIT-I**

- 1. a) Write short notes on
  - i) Scale and sludge
  - ii) Caustic embrittlement7M
- b) Discuss in brief the boiler corrosion. How is it controlled? 7M

**OR**

- 2. What are ionic exchange resins? Explain the ion-exchange method of softening water. Write reactions involved. Discuss the advantages of this method 14M

**UNIT-II**

- 3. a) What is the principle underlying conductometric titration? Discuss the titration curve obtained for a titration between HCl and NaOH. 7M
- b) Explain the construction and working of H<sub>2</sub>-O<sub>2</sub> fuel cell with neat sketch and chemical reactions 7M

**OR**

- 4. a) On what factors does the conductance of a solution depend? How would you proceed to determine the conductivity of a solution? 7M
- b) Explain passivity of metals. How it affects rate of corrosion 7M

**UNIT-III**

- 5. a) Explain the differences between thermoplastics and thermosetting plastics with examples 7M
- b) Write a brief note on Vulcanization and compounding of rubber 7M

**OR**

- 6. a) Why silicones are called inorganic polymers? Discuss the synthesis of linear and cross linked silicones. 7M
- b) Describe the preparation, properties and engineering applications of Buna-N rubber 7M

**UNIT-IV**

- 7. a) Define net and gross calorific values of a fuel. How are they determined experimentally for solid fuels? 7M
- b) A sample of Coal on analysis was found to contain the following. C = 73.0 %, H<sub>2</sub> = 3.2 %, O<sub>2</sub>=7.0 %, S = 1.5 %, N<sub>2</sub> = 2.9 %. Calculate the quantity of air required for complete combustion of 1 kg of this coal 7M

**OR**

- 8. a) Write a note on synthesis of petrol from Fischer Tropsch's synthesis. 7M
- b) Explain the following
  - i) Natural gas
  - ii) Water gas
  - iii) Biogas7M

**UNIT-V**

- 9. a) What is the significance of flash & fire point, cloud & pour point of a good lubricant? 7M
- b) Write functions of lubricants 7M

**OR**

- 10. a) Describe the mechanism of extreme pressure lubrication 5M
- b) Explain the measurement and significance of the following properties of lubricant
  - (i) Viscosity
  - (ii) Aniline point
  - (iii) Neutralization Number9M

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<b>R-15</b>
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**Code: 5G512**

I B.Tech. I Semester Supplementary Examinations August 2021

### **Engineering Graphics-I**

( Common to CE & ME )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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<b>UNIT-I</b>
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1. Construct a Hyperbola, when the distance of the focus from the directrix is equal to 50mm and eccentricity is  $\frac{3}{2}$ . Also draw a tangent and normal to the curve at a point 35mm from the directrix 14M
- OR**
2. a) Draw an Arc passing through any Three points, which are not in a straight line. 7M  
b) Construct a regular Hexagon of given side 30mm. 7M

<b>UNIT-II</b>
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3. Draw an epicycloid of a circle of 40mm diameter, which rolls outside on another circle of 120mm diameter for one revolution clockwise. Draw a tangent and a normal to it at a point 95mm from the centre of the directing circle. 14M
- OR**
4. Draw an Involute of a circle of diameter 40mm in clockwise. Also draw a tangent and normal to the curve at 90mm from the centre of circle. 14M

<b>UNIT-III</b>
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5. A line AB of length 50mm is parallel to both the H.P. and V.P. The line is 25mm above H.P. and 25mm in front of V.P. Draw its projections. 14M
- OR**
6. A line AB, 55mm long has its end A 25mm in front of the V.P and in the H.P. The line is inclined at  $45^\circ$  to the V.P. Draw the projections 14M

<b>UNIT-IV</b>
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7. A circular plane of diameter 50mm is perpendicular to both H.P. and V.P. Draw its projections 14M
- OR**
8. Draw the projections of a circle of 50mm diameter, having its plane vertical and inclined at  $30^\circ$  to the VP. Its centre is 30mm above the HP and 20mm in front of the VP. 14M

<b>UNIT-V</b>
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9. Draw the projection of cone, base 40mm diameter and axis 65mm long, when it is resting on the ground on a point on its base circle with the axis making an angle of  $30^\circ$  with the HP and  $45^\circ$  with the VP. 14M
- OR**
10. A hexagonal prism of base 25mm side and height 65mm has its axis inclined at  $45^\circ$  to the HP and has an edge of its base, on the HP and inclined at  $30^\circ$  to the VP. Draw its Projections 14M

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Code: 5GC14

I B.Tech. I Semester Supplementary Examinations August 2021

**Engineering Mathematics-I**

( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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**UNIT-I**

1. a) Solve  $(x^3 y^2 + xy)dx = dy$  7M  
 b) Find the orthogonal trajectories of the family of curve  $xy = c$  7M

**OR**

2. a) Solve  $(1-x^2)\frac{dy}{dx} - xy = 1$  7M  
 b) A tank contains 5000 liters of fresh water salt water which contains 100gm of salt per liter flows into it at the rate of 10 liters per minute and the mixture kept uniform by stirring runs out at the same rate. When will the tank contain 200000gm? And how long will it take for the quantity of salt in the tank of increase from 150000gm to 250000gm? 7M

**UNIT-II**

3. a) Solve  $(D-2)y = 8(e^{2x} + \sin 2x + x^2)$  7M  
 b) Using the method of variation of parameters, Solve  $\frac{d^2 y}{dx^2} + 4y = \tan 2x$  7M

**OR**

4. a) Solve  $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3x}$  7M  
 b) In an L.C.R circuit the charge  $q$  on a plate of a condenser is given by  $L\frac{d^2 q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E \sin pt$  the circuit is turned to resonance so that  $p^2 = \frac{1}{LC}$  find the current  $i$  7M

**UNIT-III**

5. a) Verify Lagrange's Mean value theorem for  $f(x) = e^x$  in  $[0,1]$  7M  
 b) Using Maclaurin's series, expand  $f(x) = \log(1+x)$  7M
- OR**
6. If  $f(x) = \sin^{-1} x, 0 < a < b < 1$ , use Mean value theorem to prove that  

$$\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}$$
 14M

**UNIT-IV**

7. a) Find first and second partial derivatives of  $f(x, y) = ax^2 + 2hxy + by^2$  and verify  

$$\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$$
 7M  
 b) Find the maximum and minimum values of  $f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$  7M
- OR**
8. a) If  $U = \log(x^3 + y^3 + z^3 - 3xyz)$  prove that  $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 U = \frac{-9}{(x+y+z)^2}$  7M  
 b) Find the maximum and minimum values of  $f(x, y) = x^2 + y^2 + z^2$  if  $ax^2 + by^2 + cz^2 = 1$  and  $lx + my + nz = 0$  7M

**UNIT-V**

9. Trace the curve  $r = a(1 - \cos \theta)$  14M
- OR**
10. Trace the curve  $r = a \cos 2\theta$  14M

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**R-15**

**Code: 5G111**

I B.Tech. I Semester Supplementary Examinations August 2021

**Problem Solving Techniques and C programming**

( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Describe computer hardware and computer software. 7M
- b) Define Algorithm. Write an Algorithm to read 20 numbers and print their sum. 7M

**OR**

2. a) Discuss briefly about computer languages. 7M
- b) Explain the software development method in detail. 7M

**UNIT-II**

3. a) Describe structure of C program with suitable example. 7M
- b) Write a program to find out total and average of three subject marks. 7M

**OR**

4. a) What is conditional operator? Write a program to enter two numbers and find the smallest out of them. Use conditional operator. 7M
- b) Explain in detail about C data types. 7M

**UNIT-III**

5. a) With Examples, explain while, do while and for loops 6M
- b) Write a program to find out whether the given number is perfect number or not. 8M

**OR**

6. Write a program to generate prime numbers between 1 and 1000. (use break statement to reduce number of iterations) 14M

**UNIT-IV**

7. a) What is an array? How is one dimensional array declared and initialized? 7M
- b) Write a program to find the sum of all elements in an array. 7M

**OR**

8. a) Discuss all string handling functions in C Language. 7M
- b) Write a program to find whether a given string is palindrome or not. 7M

**UNIT-V**

9. Explain different storage classes with examples 14M

**OR**

10. a) Explain the differences between call by value and call by reference with examples. 8M
- b) What is recursive function? Write a program to find factorial of integer value using recursive function. 6M

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