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| <b>R-13</b> |
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**Code: 1GC13**

B.Tech. I Year Supplementary Examinations August 2021

**Engineering Chemistry**

( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Explain the process of a phosphate, carbonate and sodium aluminate conditioning of boiler feed water  
b) Give detailed procedure for the determination of dissolved oxygen in water.
2. a) What is meant by Specific Conductance and Equivalent conductance? Write their Units?  
b) Explain the composition, working and applications of Ni-Cd cell
3. a) Write a note on the mechanism of hydrogen evolution type of wet corrosion.  
b) Explain rusting of iron with the help of electrochemical theory of corrosion
4. a) What is vulcanization of rubber? Explain why natural rubber needs vulcanization. How is it carried out?  
b) Write a note on the classification of polymers with examples
5. a) What are explosives? How are they classified?  
b) What are the precautions to be taken during storage of explosives?
6. a) What is phase rule and explain the terms involved in it with suitable examples  
b) Define the term triple point? Discuss the significance of triple point in the phase diagram of water system.
7. a) Explain various steps involved in refining of petroleum  
b) Describe how synthetic petrol is synthesized from Bergius process
8. a) Describe the analysis of cement  
b) Write a note on the classification of refractories with examples.

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Code: 1G511

B.Tech. I Year Supplementary Examinations August 2021

### Engineering Mechanics

( Common to CE & ME )

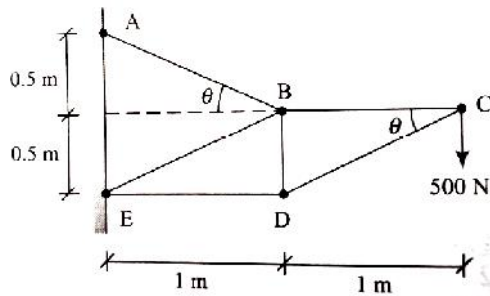
Max. Marks: 70

Time: 3 Hours

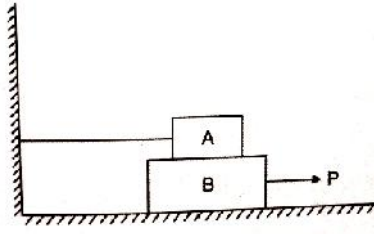
Answer any **five** questionsAll Questions carry equal marks (**14 Marks** each)

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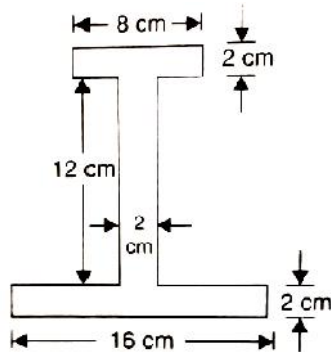
- Define and explain moment of a force. Differentiate between clockwise and anticlockwise moment.
  - What are the steps to be followed while drawing free-body diagrams? State the Lami's theorem.
- The inclinations of a force passing through the origin are  $\alpha=55.4^\circ$  and  $\beta=67.2^\circ$ . Determine the angle  $\gamma$ , if  $F_x=-100\text{N}$ . Also, express the force in vector form.
- Find the forces in all the members of the truss shown in fig.



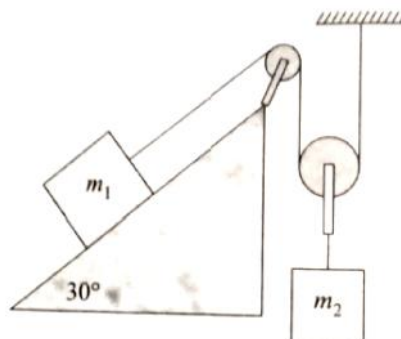
- Block-A weighing 1000N rests over block B which weighs 2000N as shown in fig. Block A is tied to wall with a horizontal string. If the coefficient of friction between blocks A and B is 0.25 and between B and floor is  $1/3$ , what should be the value of P to move the block B.



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



- Prove that the M.I. about centroidal axis of circular plate of thickness  $t$ , radius  $R$  and mass  $M$  is  $MR^2/4$ .
- A soldier fires a bullet with a velocity of  $31.32\text{m/s}$  at an angle  $\alpha$  upwards from the horizontal from his position on a hill to strike a target which is  $100\text{m}$  away and  $50\text{m}$  below his position. Find the angle of projection  $\alpha$ . Find also the velocity with which the bullet strikes the object.
- Determine the acceleration of the system of the blocks shown in fig. The coefficient of kinetic friction between the block 1 and the inclined plane is  $0.15$ . Also, determine the tension in the string. Take  $m_1=75\text{kg}$ ,  $m_2=50\text{kg}$ .



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Hall Ticket Number :

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R-13

Code: 1GC14

B.Tech. I Year Supplementary Examinations August 2021

**Mathematics-I**

( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) The rate at which bacteria multiply is proportional to the instantaneous number present. If the original number doubles in 2 hours, in how many hours will it be triple?  
b) Solve  $x \frac{dy}{dx} + y = x^3 y^6$ .
2. Solve  $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + y = x e^x \sin x$ .
3. a) Prove that  $\log(1 + e^x) = \log 2 + \frac{x}{2} + \frac{x^2}{8} - \frac{x^4}{192} + \dots$   
b) Find the maxima and minima of  $f(x) = x^3 + y^3 - 3axy$ .
4. a) Trace the curve  $r = a \sin 2\theta$   
b) Trace the curve  $x^3 + y^3 = 3axy$
5. Evaluate  $\int_0^1 \int_0^x e^y dx dy$
6. Find the Laplace transform of  $e^{-3t} (2 \cos 5t - 3 \sin 5t + 2t)$
7. Solve  $y^{11} - 3y^1 + 2y = e^{3t}$  when  $y(0) = 1, y^1(0) = 0$ .
8. Find  $\text{div } \vec{F}$  and  $\text{Curl } \vec{F}$  when  $\vec{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$ .

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