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21CIV14

First Semester B.E./B.Tech. Degree Examination, Feb./Mar. 2022
Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Briefly explain the scopes of Branches :
        i) Construction technology   ii) Water resources and Irrigation Engineering. **(10 Marks)**
    b.   What are the roles of a Civil Engineer in Infrastructural development of a Country?
        (05 Marks)
    c.   What are the requirements of a good stone?   **(05 Marks)**

OR

2   a.   How does GIS work? What are the different ways of using GIS in Business and everyday life?   **(10 Marks)**
    b.   What are the requirements of a good Brick?   **(05 Marks)**
    c.   What are advantages and disadvantages of wood?   **(05 Marks)**

Module-2

3   a.   State and prove Varignon's theorem.   **(06 Marks)**
    b.   Two forces acting on a body are 500N and 1000N as shown in Fig. Q3(b). Determine the third force F such that the resultant of all the three forces are 1000N directed at 45° to the X - axis.   **(06 Marks)**

Fig. Q3(b)

c.   A system of cables in equilibrium condition under two vertical loads of 300N and 500N as shown in Fig. Q3(c). Determine the forces developed in the different segments.   **(08 Marks)**

Fig. Q3(c)

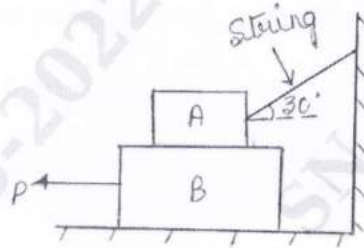**OR**
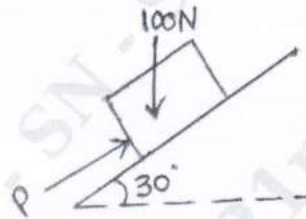
4 a. Briefly explain :
   i) Angle of friction   ii) Coefficient of friction   iii) Angle of repose.   (06 Marks)
   b. Find the force P first required to slide block B as shown in Fig. Q4(b). Find also the tension in the string. Take weight of block A = 500N , Weight of Block B = 1000N , μ = 0.2 (for all contact surface).   (06 Marks)
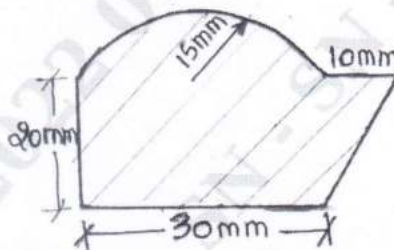
Fig. Q4(b)

   c. Find the value of P so that the body will not impend down the plane as shown in Fig. Q4(c). Also find the value of P for the body to impend up the plane. Take μ = 0.3.   (08 Marks)

Fig. Q4(c)

Module-3

5 a. Derive the expression for Centroid of a semi – circle from First principle.   (08 Marks)
   b. Determine the centroid of a shaded area of composite section as shown in Fig. Q5(b).   (12 Marks)

Fig. Q5(b)

OR

6 a. State and prove perpendicular axes theorem.   (08 Marks)
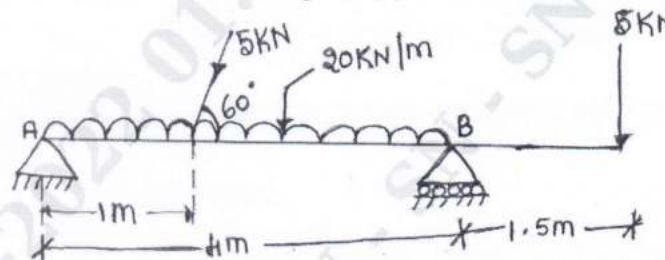   b. Find the second moment of area as shown in Fig. Q6(b) about horizontal , vertical centroidal axis.   (12 Marks)

Fig. Q6(b)

Module-4

7 a. Explain different types of supports and loads with neat sketch. (10 Marks)
   b. Find the support reaction for the beam as shown in Fig. Q7(b). (10 Marks)
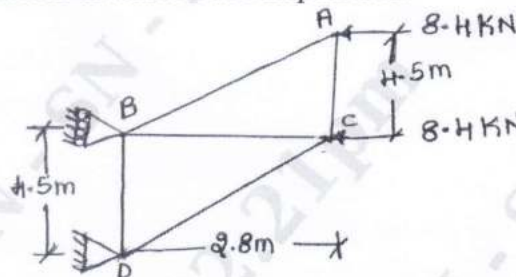
Fig. Q7(b)

OR

8 a. List the different types of Trusses. What are the assumptions made in the analysis of Trusses? (10 Marks)
   b. Determine the force in each member of truss as shown in Fig. Q8(b) using method of joints. Also state whether each member is in tension or compression. (10 Marks)

Fig. Q8(b)

Module-5

9 a. What is Super Elevation? State the importance of Super Elevation. (04 Marks)
   b. A Burglar's car starts with an acceleration of 2m/sec^2. A police van came after 10 sec and continued to chase the Burglar's car with an uniform velocity of 40m/sec. Find the time taken by the police van to overtake the Burglar's car. (08 Marks)
   c. A stone 'A' is dropped from top of a tower 50m height. At the same time another stone 'B' is thrown up from the foot of the tower with the velocity of 25m/sec. At what distance from the top and after how much time the two stones will cross each other. (08 Marks)

OR

10 a. State and explain D'Alembert's principle. (04 Marks)
    b. The equation for the angle of rotation 'θ' is given by $\theta = 2t^3 - 5t^2 + 8t + 6$, where 't' is the time taken in seconds. Find i) The angular velocity ii) Angular acceleration of the body when t = 0 and t = 5 secs. (08 Marks)
    c. A projectile is fired at certain angle with the horizontal has a horizontal range of 3.5km. If the maximum height reached is 500m, what is the angle of elevation of the Cannon? What was the Muzzle velocity of the projectile? (08 Marks)
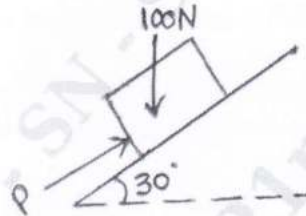
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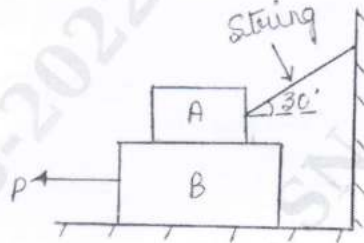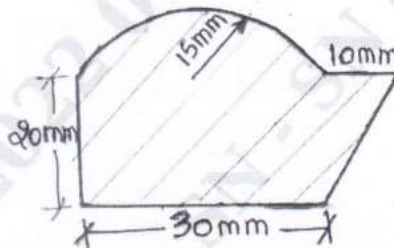
Fig. Q4(b)

   c. Find the value of P so that the body will not impend down the plane as shown in Fig. Q4(c). Also find the value of P for the body to impend up the plane. Take $\mu = 0.3$.   (08 Marks)

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Fig. Q6(b)