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21CIV14/24

First/Second Semester B.E. Degree Examination, June/July 2023
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. Explain the following branches of civil engineering
   i) Structural Engineering
   ii) Transportation Engineering **(10 Marks)**
   b. Write a brief note on role of civil engineering in Socio-economic development of the country. **(10 Marks)**

OR

2 a. Discuss the requirements of good building stones. **(10 Marks)**
   b. Explain the classification of bricks. **(10 Marks)**

Module-2

3 a. State and explain with an example
   i) Principle of transmissibility of forces   ii) Principles of super position of forces. **(10 Marks)**
   b. Determine the magnitude, direction of the resultant force for the system shown in Fig Q3(b). Also determine the X-intercepts a Y-intercepts of the resultant force with respect to point '0'
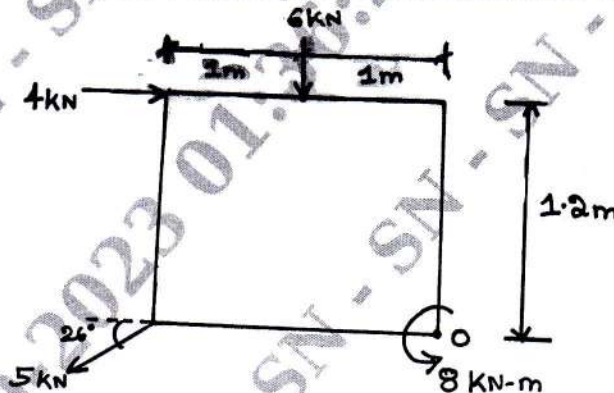

Fig Q3(b) **(10 Marks)**

OR

4 a. Explain the following with an example
   i) Coplanar concurrent force system
   ii) Coplanar non concurrent force system
   iii) Non-Coplanar concurrent force system
   iv) Non-Coplanar non-concurrent force system **(10 Marks)**
   b. Two blocks weighing 5kN × 2.5kN are connected up by a string over a frictionless pulley as shown in Fig Q4(b). Find the minimum value of force 'T' to generate an impending motion to the right. The coefficient of friction for the surface of contact for block 'A' × 'B' are 0.2 × 0.3 respectively.
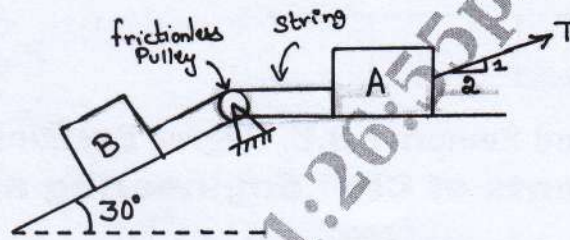
Fig Q4(b)   (10 Marks)

Module-3

5   a. Distinguish between centroid and centre of gravity.   (04 Marks)
    b. Determine the centroid of a triangle from first principles.   (06 Marks)
    c. Find the centroid of the shaded composite area with respect to the given axis as shown in Fig Q5(c).
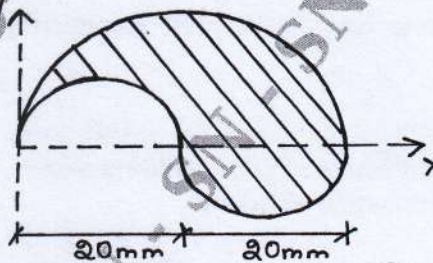

Fig Q5(c)   (10 Marks)

OR

6   a. State and prove parallel axis theorem.   (06 Marks)
    b. Determine the second moment of the area about the horizontal centroidal axis as shown in Fig Q6 (b). Also find radius of gyration about the same axis. All dimensions in Fig.Q6(b) are in mm.
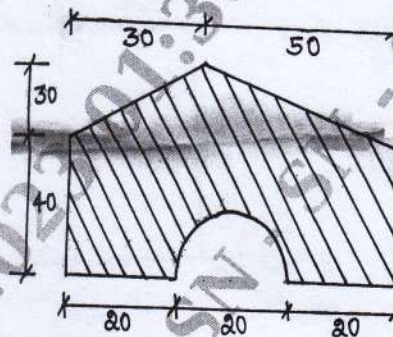

Fig Q6(b)   (14 Marks)

Module-4

7   a. Mention the different types of supports and its support reactions with a neat sketch.
    (08 Marks)

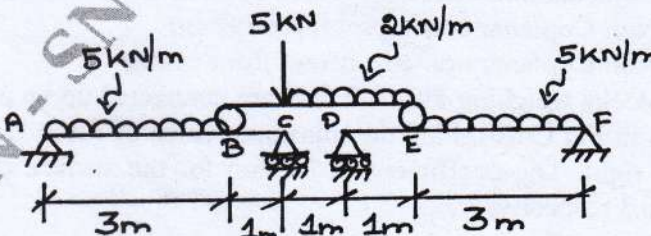   b. Determine the support reactions for the beam as shown in Fig Q7(b).

Fig Q7(b)   (12 Marks)

OR

8 a. Find the forces in all the members of the truss shown in Fig Q8(a). Indicate the forces on the truss with their nature. Use method of joints.
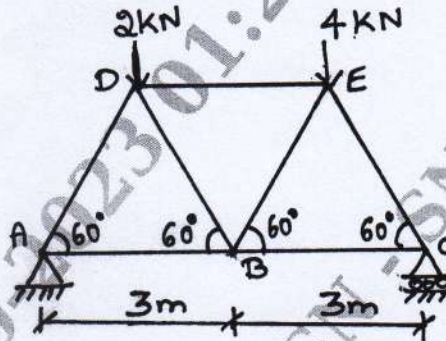

Fig Q8(a)   **(10 Marks)**

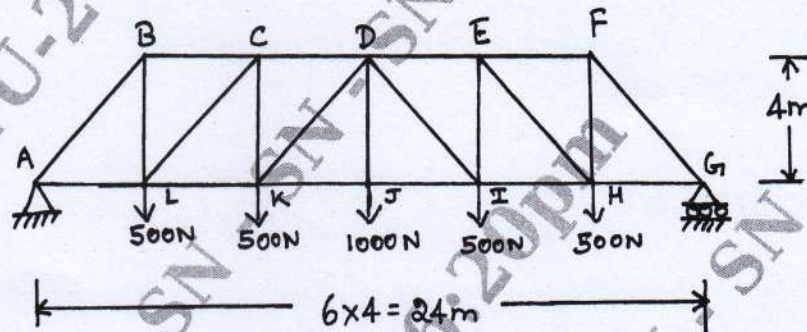 b. Find the forces in the members of CD, KD, KJ of the truss shown in Fig Q8(b). Use method of sections.

Fig Q8(b)   **(10 Marks)**

Module-5

9 a. Define the following :
   i) Kinematics ii) Kinetics iii) Motion iv) Acceleration v) Path   **(05 Marks)**
  b. What is super elevation and what is its necessity?   **(05 Marks)**
  c. Car 'A' acceleration uniformly from rest on a straight level road, Car 'B' starting from the same point 6 seconds later with zero initial velocity, accelerates at $6 m/s^2$. It overtakes the Car 'A' at 400m from the starting point. What is the acceleration of the Car 'A'?   **(10 Marks)**

OR

10 a. What is a Projectile? Define the following terms briefly
   i) Angle of projection ii) Horizontal range iii) Vertical height iv) Time of flight
                                                    (10 Marks)

  b. A cricket ball thrown from a height of 1.8m above ground level at an angle of 30° with the horizontal with a velocity of 12m/s is caught by a fielder at a height of 0.6m above the ground. Determine the distance between the two players.   **(10 Marks)**

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