CBCS SCHEME

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18CIV14/24

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023
Elements of Civil Engineering & Engineering Mechanics

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain briefly the scope of the following civil engineering fields:
  (i) Structural Engineering
  (ii) Geo-Technical Engineering
  (iii) Transportation Engineering
  (iv) Environmental Engineering **(08 Marks)**

b. State and prove parallelogram law of forces. **(05 Marks)**

c. Determine the magnitude, direction and position of the resultant force with reference to point A for the non-coplanar force system shown below in Fig. Q1(c).

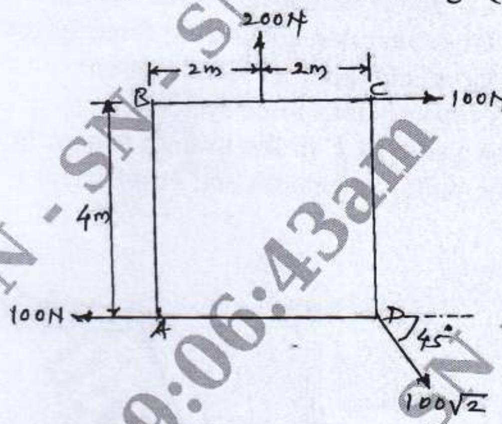

Fig. Q1 (c) **(07 Marks)**

OR

2 a. State and prove Varignon's theorem. **(06 Marks)**

b. Explain briefly impact of civil engineering infrastructure development on the social and economic development of a country. **(06 Marks)**

c. A system of four forces acting at a point on a body is as shown in Fig.Q2 (c). Determine the magnitude and direction of resultant.

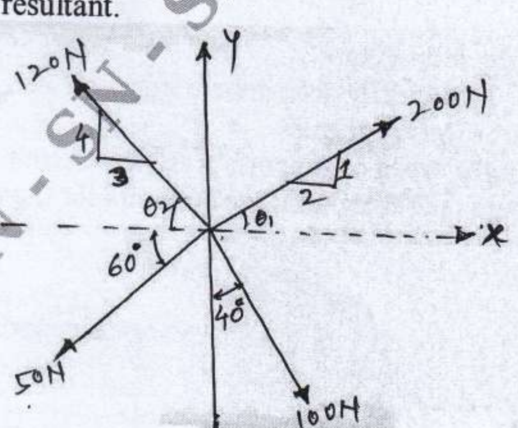

Fig. Q2 (c) **(08 Marks)**

Module-2

3 a. State and prove Lami's theorem. **(06 Marks)**

b. State the laws of static friction. **(06 Marks)**

c. Two identical cylinders each weighing 500 N are placed in a trough as shown in Fig. Q3 (c). Determine the reactions developed at contact points A, B, C and D. Assume all points of contact are smooth.

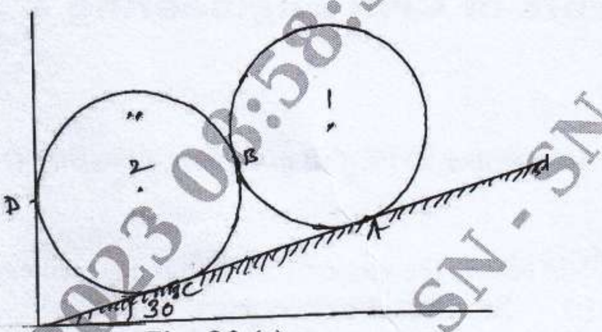

Fig. Q3 (c) **(08 Marks)**

OR

4 a. Define : (i) Angle of friction (ii) Angle of repose (iii) Co-efficient of friction (iv) Cone of friction **(08 Marks)**

b. Mention the equations of equilibrium for following force systems:
   (i) Co-planar concurrent force system.
   (ii) Co-planar non concurrent force system
   (iii) Co-planar parallel force system
   (iv) Non-coplanar force systems. **(04 Marks)**

c. What is the value of P in the system shown in Fig.Q4 (c) to cause the motion to impend? Assume the pulley is smooth and co-efficient of friction between the other contact surfaces is on 0.2.

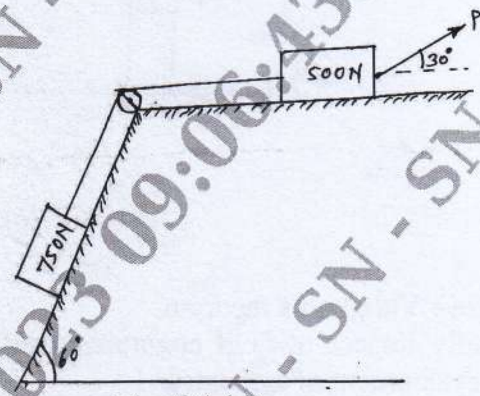

Fig. Q4 (c) **(08 Marks)**

Module-3

5 a. Define the following:
   (i) Statically determinate truss. (ii) Perfect truss.
   (iii) Deficient truss. (iv) Redundant truss **(08 Marks)**

b. Mention the types of supports with neat sketch. **(04 Marks)**

c. Determine the reactions at the supports for the beam as shown in Fig. Q5 (c).

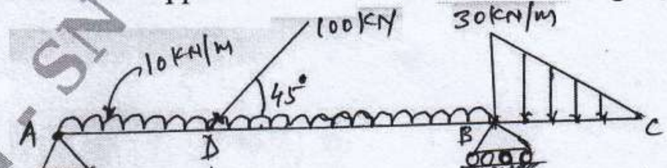

Fig. Q5 (c) **(08 Marks)**

OR

6 a. Explain the types of loadings on the beam with neat sketches. **(08 Marks)**

b. Determine the forces in all the members of the truss shown in Fig. Q6 (b) and tabulate the results.

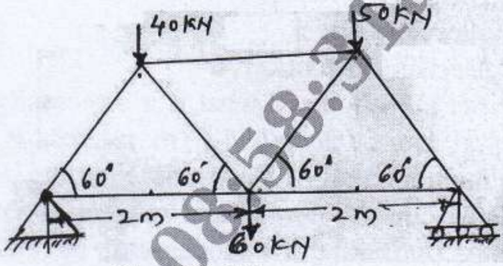

Fig. Q6 (b) **(12 Marks)**

Module-4

7 a. State and prove the following theorems:

(i) Parallel Axis theorem.

(ii) Perpendicular Axis theorem **(12 Marks)**

b. Locate the centre of the Shaded Area shown in Fig.Q7 (b).

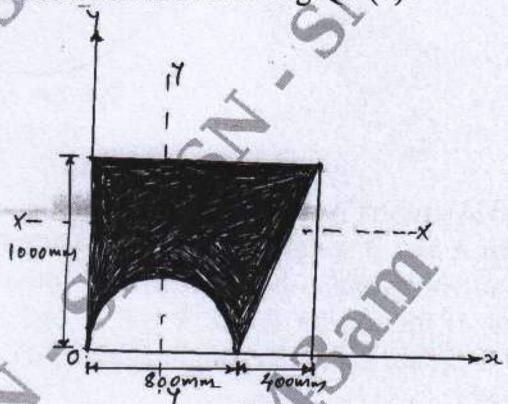

Fig. Q7 (b) **(08 Marks)**

OR

8 a. Determine the centroid for sector of circle by the method of integration. **(08 Marks)**

b. Determine the second moment of built up area shown in Fig.Q8 (b) about it's horizontal centroidal axis and find corresponding radius of gyration (All dimensions are in mm)

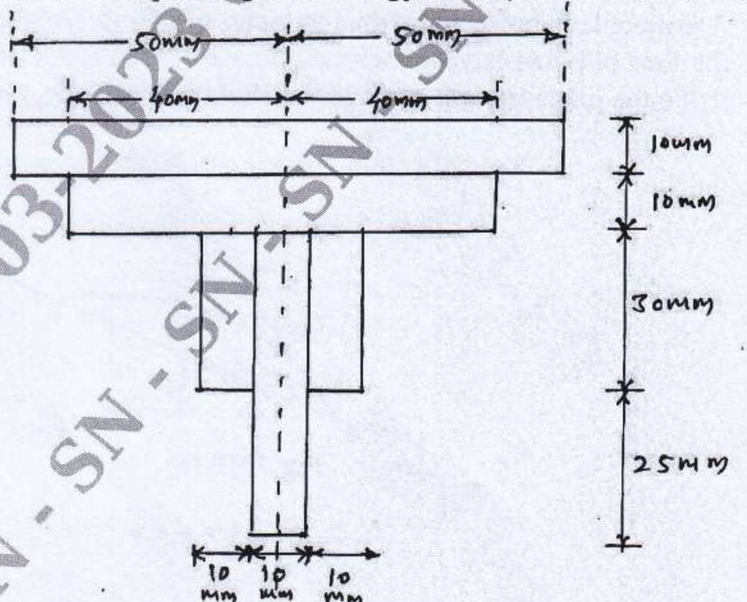

Fig. Q8 (b) **(12 Marks)**

Module-5

9 a. Define the following :
   (i) Displacement
   (ii) Velocity
   (iii) Acceleration
   (iv) Rectilinear motion **(04 Marks)**

b. What is super elevation and what is it's necessity? **(04 Marks)**

c. A horizontal bar of length 1.5 m rotates. It accelerates uniformly from 1200 rpm to 1500 rpm in an interval of 5 seconds. Find the linear velocity at the beginning and end of the interval. What are the normal and tangential components of acceleration at the midpoint of bar after 4 seconds, after the acceleration begins. Refer Fig. Q9 (c)

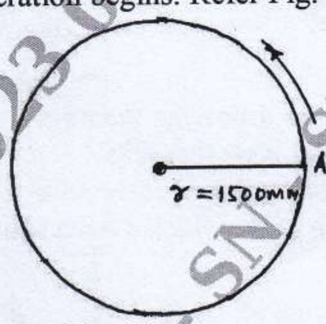

Fig. Q9 (c) **(12 Marks)**

OR

10 a. State the D'Alembert's principle. **(02 Marks)**

b. Two blocks A and B weighing 1200 N and 300 N are connected by a string and move along a horizontal rough plane by a horizontal force of 600 N as shown in Fig. Q10 (b). The co-efficient of friction for Block A is 0.25 and for block B is 0.3. Determine the tension in string and acceleration of the weight applying D'Alembert's principle.

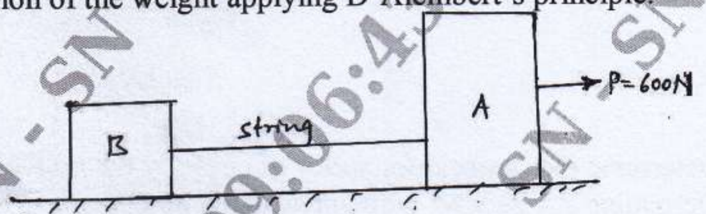

Fig. Q10 (b) **(08 Marks)**

c. A projectile is projected with a velocity of 250 m/sec at an angle of 60° with horizontal from the foot of plane having inclination of 30°. Determine the distance where the projectile will strike the plane (range) and time of flight taken. Take g = 9.81 m/sec.

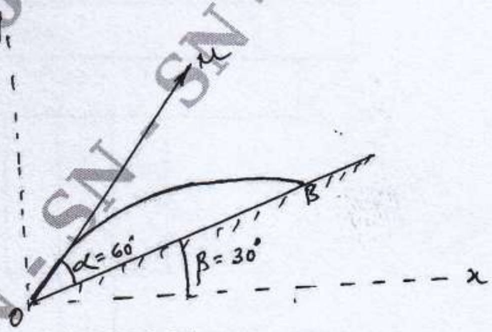

Fig. Q10 (c) **(10 Marks)**

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