CBCS SCHEME

USN | | | | | | | | | | |

18CIV14/24

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 briefly the scope of civil engineering in the specification of,
(i) Geo-technical engineering
(ii) Structural engineering **(08 Marks)**

b. Briefly explain the role of civil engineers in infrastructural development of the nation. **(08 Marks)**

c. Define force and mention its characteristics. **(04 Marks)**

OR

2 a. State and prove Varignon's theorem of moments. **(08 Marks)**

b. For the five force concurrent system acting on a bolt shown in Fig. Q2 (b), obtain the resultant force.

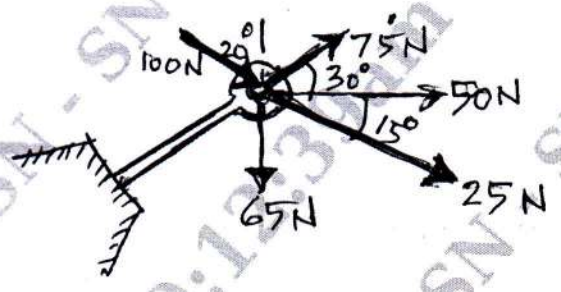

Fig. Q2 (b) **(08 Marks)**

c. What is moment of a force? Explain. **(04 Marks)**

Module-2

3 a. Draw the FBD (Free Body Diagram) for a cylinder held between a smooth wall and a smooth rod. The bottom of the rod is hinged to the wall and top end is held by a string at an angle of 90° to the rod. The angle between the rod and wall is 30°.
Weight of cylinder = W_C ; Weight of rod = W_R, Length of rod = L, Radius of cylinder = r. **(04 Marks)**

b. Determine the magnitude of W and tension induced in each segment of string for the Fig. Q3 (b) shown.

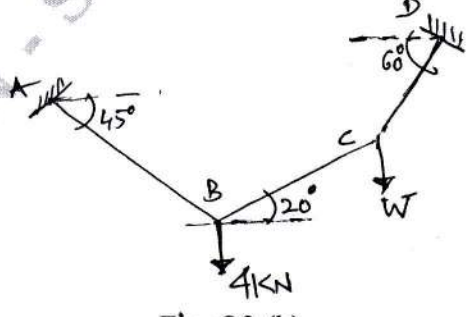

Fig. Q3 (b) **(08 Marks)**

c. Two smooth rollers of same radius and weight each equal to 200 N are placed in a trough as shown in Fig. Q3 (c). Find the contact reactions R_A, R_B, R_C and R_D assuming all surfaces are smooth.

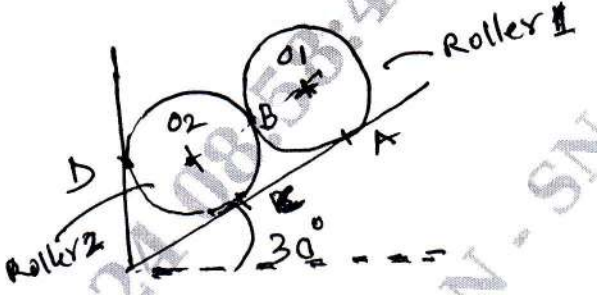

Fig. Q3 (c) **(08 Marks)**

OR

4 a. Define Friction and explain the different types of friction. **(06 Marks)**

b. A 1000 N block is placed on an inclined plane as shown in Fig. Q4 (b). Take co-efficient of friction of surfaces = 0.25.
Determine the horizontal force to be applied for,
(i) Impending motion down the plane.
(ii) Impending motion up the plane.

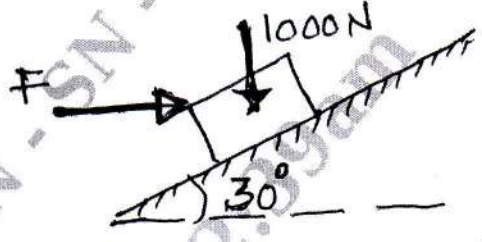

Fig. Q4 (b) **(08 Marks)**

c. A 100 N block resting on a rough horizontal surface is pulled by a 30 N force inclined at 15° with horizontal as shown in Fig. Q4 (c). Find the co-efficient of friction.

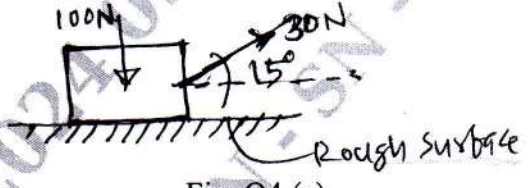

Fig. Q4 (c) **(06 Marks)**

Module-3

5 a. Define a beam and explain the different types of beams and supports. **(08 Marks)**

b. Obtain the distance **x** for the beam loaded as shown in Fig. Q5 (b) such that reactions R_A and R_B are equal.

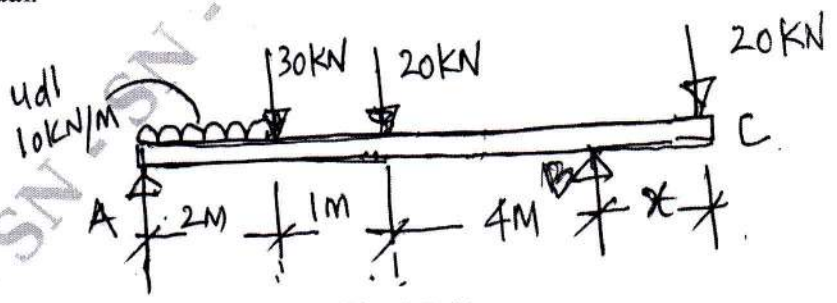

Fig. Q5 (b) **(12 Marks)**

OR

6 a. Give the step by step analysis of a plane truss using the method of sections. **(06 Marks)**

b. Analyze the forces in the members of the plane truss shown in Fig. Q6 (b) using method of joints.

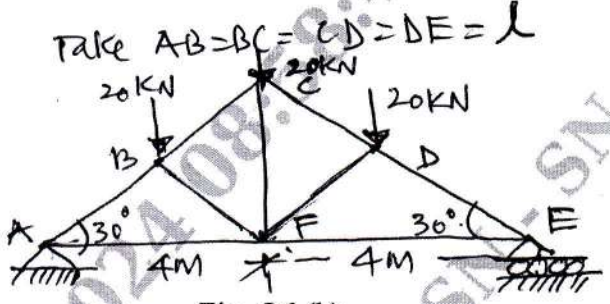

Fig. Q6 (b) **(14 Marks)**

Module-4

7 a. Obtain the location of the centroid for a semi circular area when the diameter AB is horizontal as in Fig. Q7 (a).

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

b. Locate the centroid of the composite area shown in Fig.Q7 (b) with respect to point 'O'.

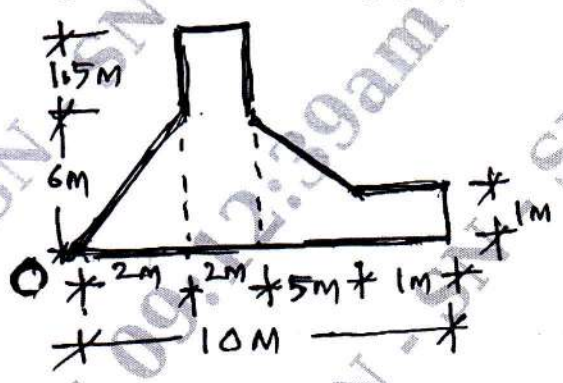

Fig. Q7 (b) **(12 Marks)**

OR

8 a. State and prove the transfer theorem. **(06 Marks)**

b. Compute the second moment of area for the composite Fig. Q8 (b) about the centroidal horizontal axis. Also find the radius of gyration.

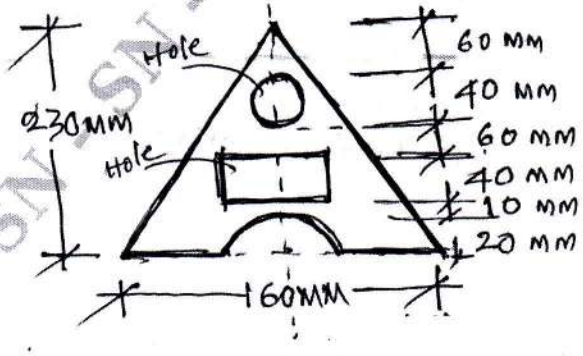

Fig. Q8 (b) **(14 Marks)**

Module-5

9 a. Define the following :
   (i) Displacement
   (ii) Speed.
   (iii) Velocity
   (iv) Acceleration. **(08 Marks)**

b. A burglar's car starts with an acceleration of 2 m/sec^2. A police van reached after 10 seconds and continued to chase the burglar's car with a uniform velocity of 40 m/s. Find the time taken by the police van to overtake the burglar's car. **(08 Marks)**

c. State the Newton's Laws of motion. **(04 Marks)**

OR

10 a. What is super elevation? Derive the expression for super elevation. **(08 Marks)**

b. A stone is dropped down a well with no initial velocity and after 4.5 seconds the splash is heard. Then a second stone is thrown downward with an initial velocity of V_0 and the splash is heard in 4 seconds. If the velocity of sound is constant at 336 m/sec determine the initial velocity of the second stone. **(08 Marks)**

c. A Lift carries a weight of 4000 kN and is moving with a uniform acceleration of 3.5 m/sec^2. Determine the tension in the cable when lift is moving upward. **(04 Marks)**

* * * * *