CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

First/Second Semester B.E. Degree Examination, July/August 2021
Elements of Civil Engineering and Mechanics

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Explain the role of civil engineers in the infrastructural development. **(06 Marks)**
   b. Define: parallelogram law of force, resolution and composition of force. **(06 Marks)**
   c. Find the magnitude and direction and position of resultant force for the system shown in Fig.Q.1(c). **(08 Marks)**
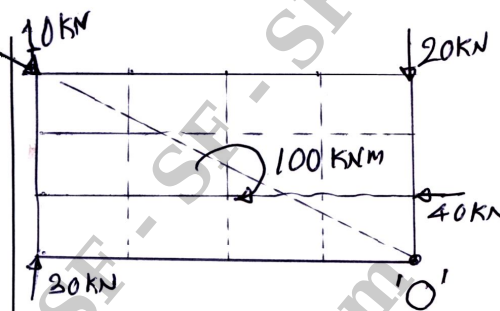

Fig.Q.1(c)

2 a. Explain different fields and scope of different field of Civil Engineering. **(06 Marks)**
   b. State and prove Varignon's principle of moments. **(06 Marks)**
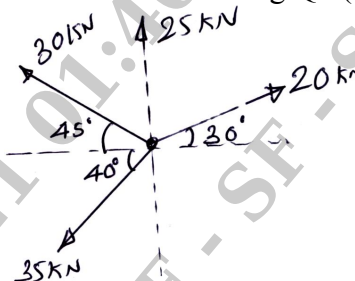   c. Find the resultant for the system of force shown in Fig.Q.2(c). **(08 Marks)**

Fig.Q.2(c)

3 a. Find the tension in the cable for the system shown in Fig.Q.3(a) take AB parallel to CD. **(08 Marks)**
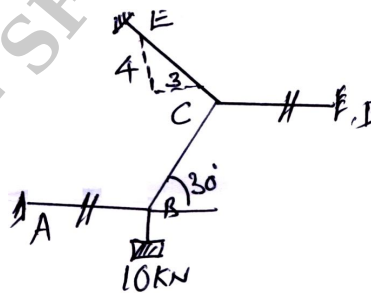

Fig.Q.3(a)

   b. Explain limiting friction and laws of friction. **(04 Marks)**

c. The block A and B weighing 20kN and 15kN are connected by a wire passing over smooth frictionless pulley as shown in Fig.Q.3(c). Determine the magnitude of force p required to impend the motion. Take $\mu = 0.2$. **(08 Marks)**
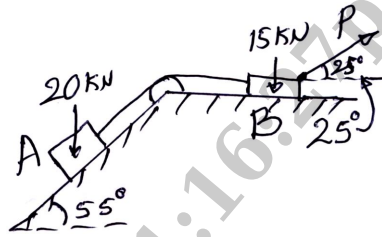

Fig.Q.3(c)

4 a. Find the reaction at the surface of contact for two identical cylinder as shown in Fig.Q.4(a) weight of cylinder 1000N. **(08 Marks)**
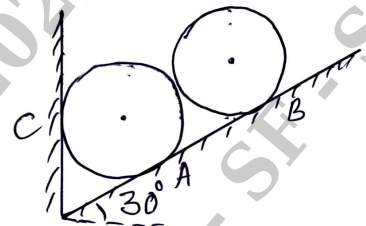

Fig.Q.4(a)

b. Define: i) Equilibrium   ii) Lamis theorem. **(04 Marks)**

c. A body resting on horizontal require a pull of 180N inclined at 30° to the horizontal just to move it. It was found that push of 220N inclined at 30° to the horizontal to move the same. Determine the weight of body and coefficient of friction. **(08 Marks)**

5 a. Explain different types of loads and supports with the help of sketches. **(06 Marks)**

b. What are the assumption made in the analysis of trusses? **(04 Marks)**

c. Determine the reaction at support for the beam shown in Fig.Q.5(c). **(10 Marks)**
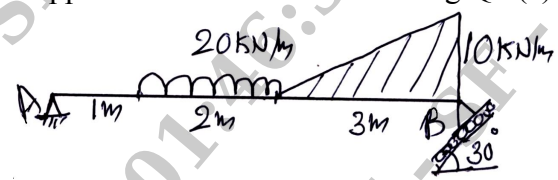

Fig.Q.5(c)

6 a. Explain the methods of analysis of trusses. **(04 Marks)**

b. Find the reaction for the compound beam shown in Fig.Q.6(b). **(08 Marks)**
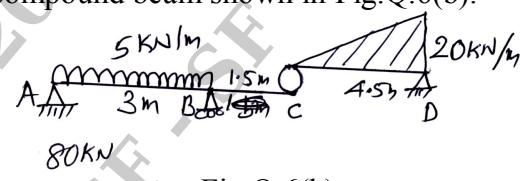

Fig.Q.6(b)

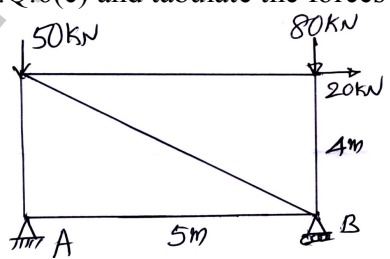c. Analyze the truss shown in Fig.Q.6(c) and tabulate the forces in the members. **(08 Marks)**

Fig.Q.6(c)

7 a. Define centroid. Distinguish between centroid and center of gravity. **(04 Marks)**
b. Derive center of gravity for semicircle of radius 'r'. **(06 Marks)**
c. Find I_{XX}, I_{YY} above CG axis for the area shown in Fig.Q.7(c). **(10 Marks)**
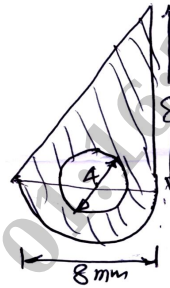

Fig.Q.7(c)

8 a. Define: i) Moment of Inertia   ii) Parallel axes theorems   iii) Perpendicular axis theorems
iv) Radius of gyration. **(04 Marks)**
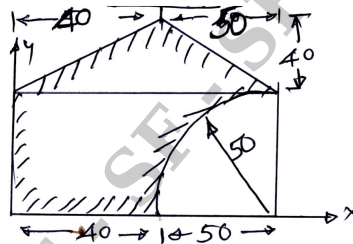b. Find the CG with respect to XY axis for the area shown in Fig.Q.8(b). **(08 Marks)**

Fig.Q.8(b)

c. Find I_{XX} and I_{YY} for the area shown in Fig.Q.8(c). **(08 Marks)**
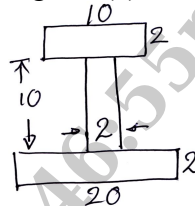

Fig.Q.8(c)

9 a. Derive the equation for the path of a projectile. Obtain the expression for max height, time of flight and max range. **(08 Marks)**
b. An aeroplane is flying horizontally at a height 8000m. A bomb is released from aeroplane having speed 600kmph. Determine the time required for the bomb to reach ground and horizontal distance travelled by the bomb. **(06 Marks)**
c. A tower 90 height A particle is dropped from top of the tower at the same time another particle is projected upwards from foot of the tower both meet at 3am from bottom. Find the velocity of projection of second particle. **(06 Marks)**

10 a. Explain Newtons laws of motion. **(04 Marks)**
b. Explain: i) Super elevation   ii) Rectilinear and curvilinear motion   iii) Projectile motion. **(06 Marks)**
c. A projectile is fired from the edge of a 150m high cliff with an initial velocity 180m/sec at an angle of elevation of 30° with horizontal. Find:
i) Horizontal distance between gun and point where the bullet strikes the ground.
ii) Greatest height above the ground reached by projectile.
iii) Actual velocity with which bullet strikes the ground. **(10 Marks)**

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