

# CBCS Scheme

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## First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018 Elements of Civil Engineering and Engineering Mechanics

Max. Marks:80

Time: 3 hrs.

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

### Module-1

- 1 a. Name different fields of civil engineering and explain any two of them. (06 Marks)  
b. With neat sketch, explain any two types of dams. (06 Marks)  
c. Find the moment of 500N force about points A, B, C and D as shown in Fig.Q1(C). (04 Marks)

OR

- 2 a. Explain the role of civil engineer in infrastructural development of the country. (06 Marks)  
b. Explain the Nagpur road plan classification. (06 Marks)  
c. A square ABCD has forces acting along its sides as shown in Fig.Q2(c). Find the value of P and Q, if the system reduces to a couple. Also find magnitude of the couple if the side of the square is 2m. (04 Marks)

### Module-2

- 3 a. State and prove parallelogram law of forces. (06 Marks)  
b. The forces acting on the system are shown in Fig.Q2(b). Determine the magnitude and direction of the resultants. (06 Marks)  
c. With neat sketches explain angle of friction, angle of repose and cone of friction. (04 Marks)

OR

- 4 a. State laws of dry friction. (04 Marks)  
b. A chord supported at A and B carries a load of 100kN at D and a load of W at C as shown in Fig.Q4(b). Find the values of W so that CD remains horizontal. Also determine tension in each chord. (06 Marks)  
c. A block weighing 4000N is resting on horizontal surface supports another block of 2000N as shown in Fig.Q4(c). Find the horizontal force F just to move the block to the left. Take coefficient of friction for all surfaces of contact to be 0.2. (06 Marks)

### Module-3

- 5 a. State and prove Varignon's principle of moments. (06 Marks)  
b. A rigid plate is subjected to the forces as shown in Fig.Q5(b). Compute magnitude direction and position of resultant force with respect to centroid point O of the plate. (06 Marks)  
c. Determine the support reactions for the beam shown in Fig.Q5(c). (04 Marks)

OR

- 6 a. With neat sketches indicating the reactions explain types of supports. (04 Marks)  
 b. The forces acting on 1m length of a dam are as shown in Fig.Q6(b). Determine the magnitude, direction and position of resultant from O. (06 Marks)  
 c. A uniform beam AB hinged at A, is kept horizontal by supporting and settling a 400kN with the help of a rope tied at B and passing over smooth pulley at C. The bar weights 200kN. Determine the reactions at the supports A and C as well as the tension in the string. Refer Fig.Q6(c). (06 Marks)

Module-4

- 7 a. State and prove parallel axis theorem. (05 Marks)  
 b. From first principles determine the centroid of a rectangle. (05 Marks)  
 c. Determine the centroid of the area shown in Fig.A7(c) with respect to the axis shown. (06 Marks)

OR

- 8 a. From first principles determine the centroid of quarter circle. (06 Marks)  
 b. Determine the moment of inertia of the symmetric I section shown in Fig.Q8(b) about its centroidal x – x axis and y – y axis. Also determine polar moment of inertia. (10 Marks)

Module-5

- 9 a. Derive the expression for maximum height attained by the projectile. (05 Marks)  
 b. A car starts from rest and accelerates uniformly to a speed of 75 kmph over a distance of 1000M. Find acceleration of the car and time taken to attain this speed. If a further acceleration rises the speed to 100kmph in 10sec, find the new acceleration and the further distance moved. (05 Marks)  
 c. The equation of motion of particle is given by  $a = 4t^3 - 3t^2 + 6$  where a : acceleration in  $m/sec^2$  and t : time in seconds. The velocity of the particle at  $t = 1$  second is 5.0 m/sec and displacement is 10m. Determine the displacement and velocity at  $t = 5$  seconds. (06 Marks)

OR

- 10 a. What is super elevation? Explain the objects of providing super elevation. (04 Marks)  
 b. A ball was thrown vertically upwards from the ground with the velocity of 60m/sec. After 3 seconds another ball was thrown vertically upwards from the ground. If both the balls strike the ground at the same time, determine the velocity with which the second ball was thrown. (06 Marks)  
 c. A particle is projected in air with a velocity of 120m/sec at an angle of  $30^\circ$  with the horizontal. Determine :  
 i) The horizontal range  
 ii) Maximum height attained by the particle  
 iii) The time of flight. (06 Marks)

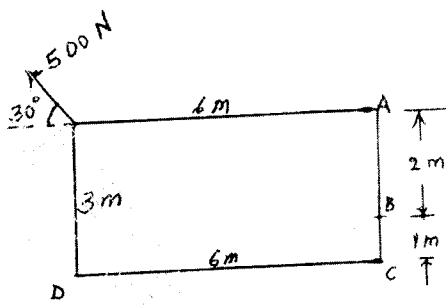


Fig.Q1(c)

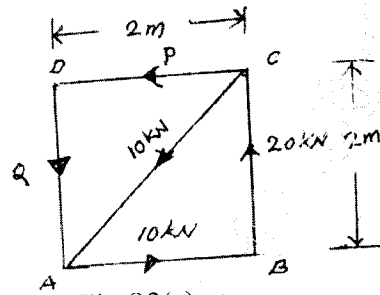


Fig.Q2(c)

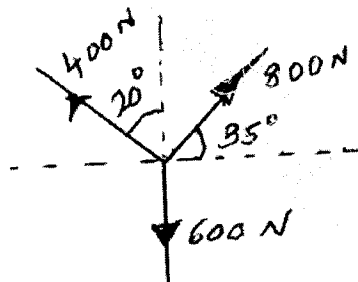


Fig.Q3(b)

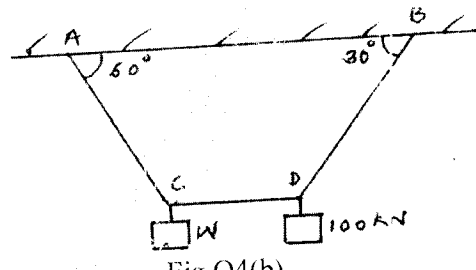


Fig.Q4(b)

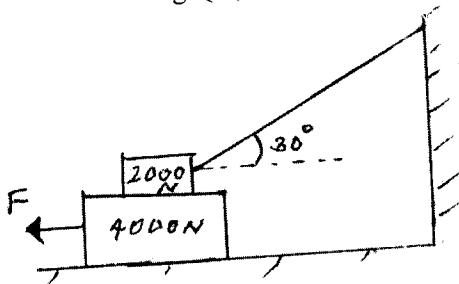


Fig.Q4(c)

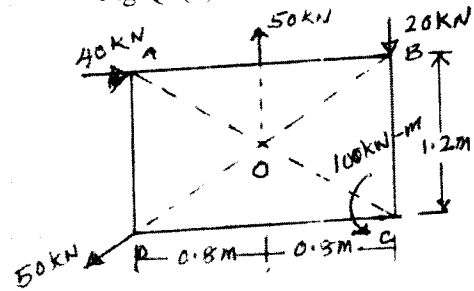


Fig.Q5(b)

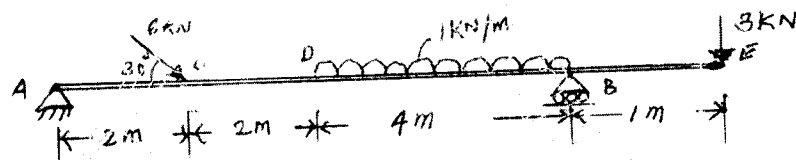


Fig.Q5(C)

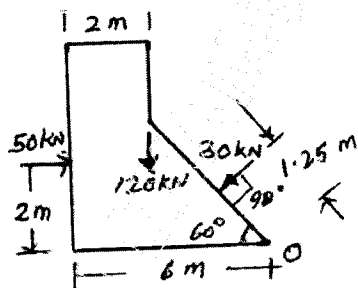


Fig.Q6(b)

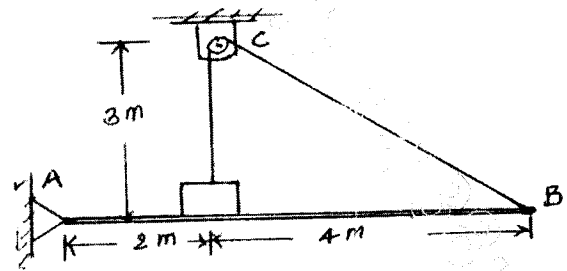


Fig.Q6(c)

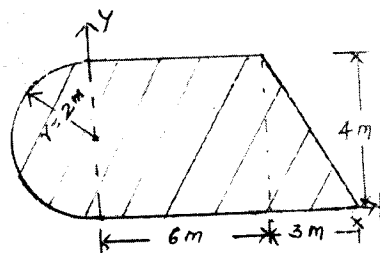


Fig.Q7(c)

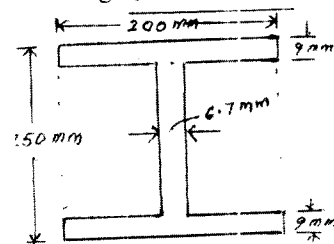


Fig.Q8(b)