C.M.R. INSTITUTE OF TECHNOLOGY
CMR
BANGALORE

CBCS SCHEME

USN | | | | | | | | | |

18CIV14/24

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

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Missing data, if any, may be suitably assumed.

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 following areas of civil engineering :
i) Irrigation engineering
ii) Environmental engineering. **(10 Marks)**

b. What are the roles of civil engineers in the infrastructural development of a country? **(10 Marks)**

OR

2 a. State and explain basic idealization in mechanics. **(06 Marks)**

b. State and prove law of parallelogram of forces. **(06 Marks)**

c. Two forces acting on a body are 500N and 1000N as shown in Fig.Q2(c). Determine the third force F such that the resultant of all the three forces is 1000N, directed at 40° to the X axis.

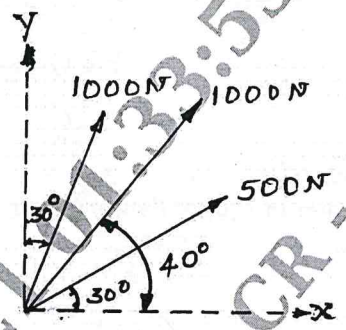

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. State and prove Lami's theorem. **(08 Marks)**

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

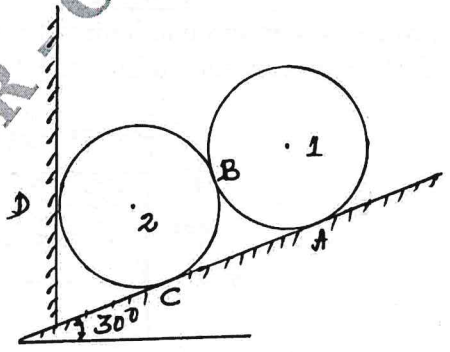

Fig.Q3(b) **(10 Marks)**

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OR

4 a. State the laws of dry friction. **(04 Marks)**

b. Explain the types of friction. **(06 Marks)**

c. Find the force p just required to slide the block B in the arrangement shown in Fig.Q4(c). Find also the tension in the string. Given weight of block A = 500N and weight of block B = 1000N. $\mu = 0.2$ for all contact surfaces.

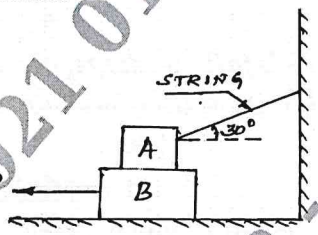

Fig.Q4(c) **(10 Marks)**

Module-3

5 a. Explain with sketches different types of loads. **(04 Marks)**

b. Explain with sketches different types of supports. **(06 Marks)**

c. Determine the reactions developed at supports A and B of overhanging beam shown in Fig.Q5(c).

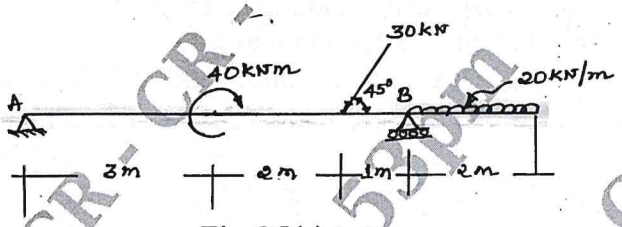

Fig.Q5(c) **(10 Marks)**

OR

6 a. List the different types of trusses. **(06 Marks)**

b. Analyse the truss shown in Fig.Q6(b) by method of joints.

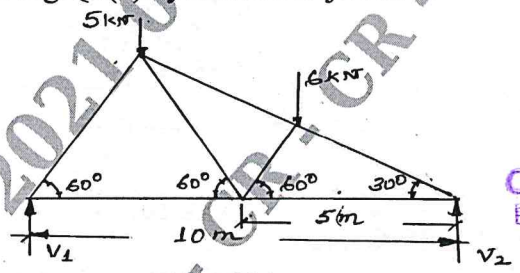

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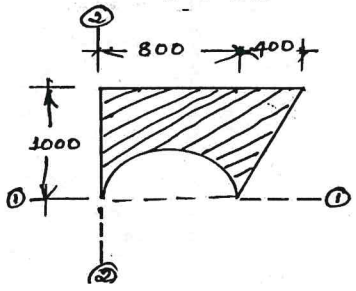
Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Determine the centroid of a semicircular lamina from the first principle. **(08 Marks)**

b. Locate the centroid of the lamina shown in Fig.Q7(b), with respect to axes 1 – 1 and 2 – 2.



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OR

8 a. State and prove parallel axes theorem. **(08 Marks)**

b. Determine the moment of inertia of the symmetric I-section shown in Fig.Q8(b) about its centroidal axes x-x ad y-y.

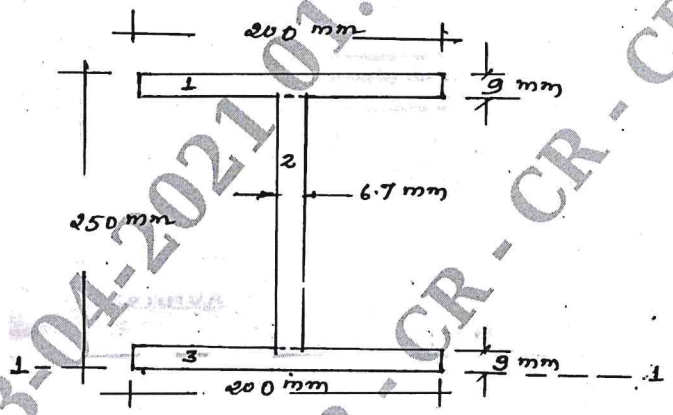

Fig.Q8(b) **(12 Marks)**

Module-5

9 a. Define the following :
i) Projectile
ii) Trajectory
iii) Time of flight
iv) Range. **(08 Marks)**

b. A projectile is fired at certain angle has a horizontal range of 3.5km. If the maximum height reached is 500m, what is the angle of elevation of the cannon? What was the muzzle velocity of the projectile? **(06 Marks)**

c. A Burglar's car starts with an acceleration of $2m/sec^2$. A police van came after 10 sec and continued to chase the burglar's car with an uniform velocity of 40m/sec. find the time taken by the police van to overtake the Burglar's car. **(06 Marks)**

OR

10 a. State Newton's second law of motion and D'Alembert's principle. **(04 Marks)**

b. A lift carries a man of weight 4000kN and is moving with a uniform acceleration of $3.5m/sec^2$. Determine the tension in the cable when :
i) Lift is moving upwards
ii) Lift is moving downwards. **(08 Marks)**

c. A car travelling at a speed of 75kmph applies brake and comes to a halt after skidding 60m. Determine :
i) Deceleration
ii) Time to stop the car
iii) Coefficient of friction between road and tyres. **(08 Marks)**

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