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Reg. No. : .....

Name : .....

Combined First and Second Semester B.Tech. Degree Examination, April 2013
(2008 Scheme)
08-105 ENGINEERING MECHANICS

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** questions under Part **A** and **six full** questions under Part **B** selecting not more than **two** from each of the three modules there under. Questions under Part **A** carry **5** marks **each**, while those under Part **B** carry **10** marks **each**.*

PART – A

1. The resultant of two forces P and Q is R. If Q is doubled, the new resultant is perpendicular to P. Prove that Q = R.
2. State and explain the principle of trans missibility of forces.
3. Distinguish between centroid and centre of gravity.
4. With an example, describe the phenomenon of combined motion of rotation and translation.
5. State and explain D'Alembert's principle.
6. Define simple harmonic motion. Find how many seconds a clock would loose per day if the length of the pendulum were increased in the ratio 900:901.
7. What are the basic elements of a vibrating system ?
8. State and explain law of conservation of momentum.

P.T.O.

PART – B

Module – I

9. A square ABCD has forces acting along its sides as shown in Fig. 1. Find the values of P and Q if the system reduces to a couple. Also find magnitude of the couple, if the side of the square is I m.

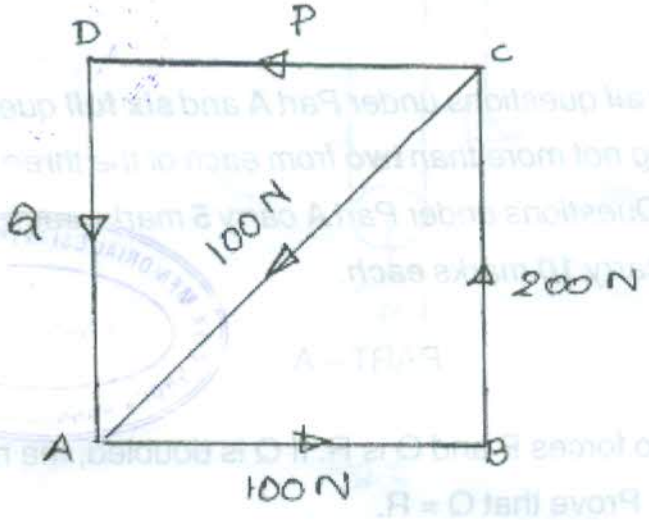

Fig. 1

10. Find the support reactions for the beam shown in Fig. 2.

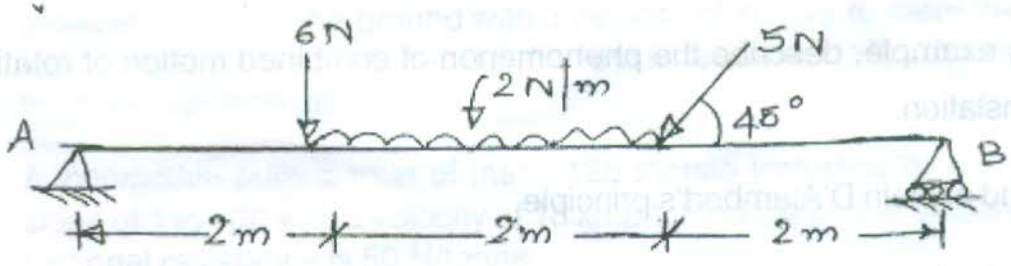

Fig. 2

11. The lines of action of three forces concurrent at origin O passes through points A (–1, 2, 3), B (1, 0, –2) and C (1, –1, 3). If the magnitudes of the forces are 40 kN, 15 kN and 30 kN respectively, find the magnitude and direction of their resultant.

Module – II

12. Determine the moment of inertia about the horizontal centroidal axis for the area shown in Fig. 3.

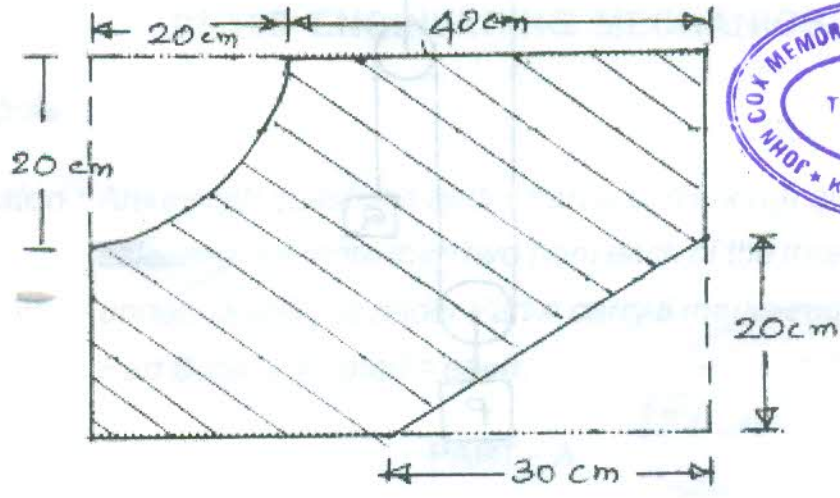

Fig. 3

13. A reciprocating engine mechanism is shown in Fig. 4 below. The crank OA is 16 cm long and rotating at 550 rpm. The connecting rod AB is 70 cm long. Find

a) Angular velocity of the connecting rod

b) Velocity of the piston B and

c) Velocity of a point C on the connecting rod at a distance 25 cm from A when $\theta = 45^\circ$.

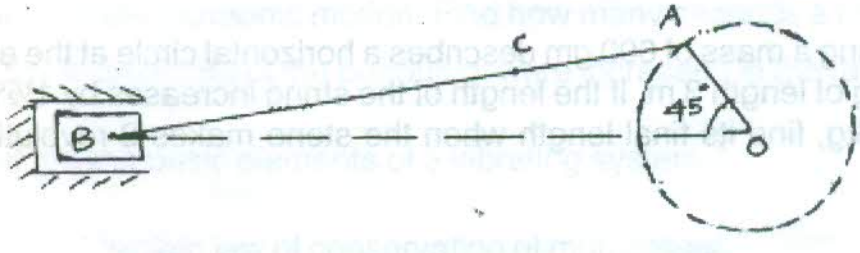

Fig. 4

14. Two weights P and Q are connected as shown in Fig. 5. Assuming P = 400 N and Q = 300 N, find the acceleration of the weights.

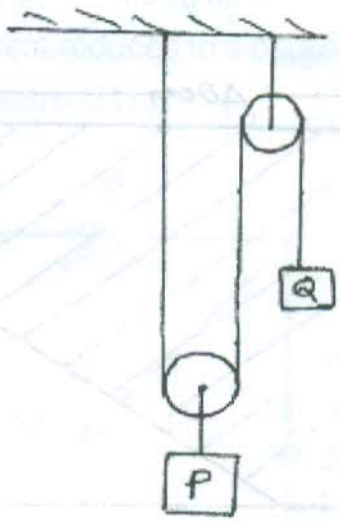

Fig. 5

Module – III

15. A ball is let fall from a height of 20 m and at the same instant a similar ball is projected up from the ground with a velocity of 40 m/s to meet the first ball. If the coefficient of restitution is 0.5, find the time elapsed after the impact before the balls reach the ground.

16. A locomotive pulls a train of mass 125 tonnes including its own mass up a slope of 1 in 100 with a velocity of 18 kmph. Find the power of the engine if the frictional resistance is 50 N/tonne.

17. A stone having a mass of 600 gm describes a horizontal circle at the end of an elastic string of length 3 m. If the length of the string increases by 1½% under a load of 6 kg, find its final length when the stone makes 3 revolutions per second.