Total No. of printed pages = 4

BES-304/AM/3rd Sem/2017/M

APPLIED MECHANICS

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) State triangle law of forces with a neat sketch. 3

   (b) State the specifications required to define a force. 4

   (c) State and explain the law of equilibrium. 5

   (d) Define resultant and equilibrant of forces. 2

2. (a) State the conditions of equilibrium for a system of coplanar forces. 3

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(b) What is Lami's theorem ? State and explain. 7

(c) Define the moment of a force about a point. What is the arm of a moment ? 2+2=4

3. (a) Write down the different types of parallel forces in a plane. 3

(b) Define center of gravity and centroid. 2

(c) Explain the terms : trajectory, range of the projectile, time of flight. 5

(d) How would you find out, if a particular body is at rest or in motion ? 1

(e) What do you mean by the term 'acceleration' ? Define positive acceleration and negative acceleration. 3

4. (a) Four forces of magnitude 10kN, 15 kN, 20 kN and 40kN are acting at a point '0'. The angles made by 10kN, 15kN, 20kN and 40kN with x-axis are 30°, 60°, 90° and 120° respectively. Find the magnitude and direction of the resultant force. 7

(b) A beam AB 5m long is supported at its ends A and B. Two point loads W_1 and W_2 are placed at C and D, 1m and 3m respectively from the end A. If the reaction at A is twice the reaction at B, find the ratio of the loads W_1 and W_2. 7

5. (a) A body of weight 500N is pulled up an inclined plane, by a force of 350N. The inclination of the plane is 30° to the horizontal and the force is applied parallel to the plane. Determine the co-efficient of friction. 6

(b) An effort of 180N is required just to move a certain body up an inclined plane of angle 15°, the force being parallel to the plane. If the angle of inclination of the plane is made 20°, the effort required, again applied parallel to the plane, is found to be 210N. Find the weight of the body and co-efficient of friction. 8

6. (a) Find the centre of gravity of an I-section with top flange 100mm × 20mm, web 200mm × 30mm and bottom flange 300mm × 40mm. 7

(b) A car moves along a straight line whose equation of motion is given by

$s = 12t+3t^2-2t^3$,

where(s) is in metres and (t) is in seconds. Calculate :

(i) velocity and acceleration at start, and

(ii) acceleration, when the velocity is zero. 7

7. Write short notes on any *four* : $4\times3.5=14$

(i) Parallelogram law of forces.

(ii) Types of moments

(iii) System of forces

(iv) Effects of a force

(v) Laws of friction

(vi) Principles of equilibrium.