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V—73—2017

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2017

MATHEMATICS

Paper XV (B)

[Mechanics-I (Statics)]

(Monday, 13-11-2017)

Time : 10.00 a.m. to 12.00 noon

Time— 2 Hours

Maximum Marks—40

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

1. Attempt any *five* of the following :

- (a) Define like parallel forces. 2 each
- (b) Find the resultant of two forces whose magnitudes are 8 kg and 7 kg respectively at an angle of 60° .
- (c) Define equilibrium of system of forces.
- (d) State the Polygon of forces.
- (e) Define couple.
- (f) Define the motion of translation of the rigid body.

2. Attempt any *two* of the following :

5 each

- (a) Find the magnitude and direction of the resultant \vec{R} of two forces \vec{P} and \vec{Q} acting at an angle θ .
- (b) Find the resultant of two like parallel forces acting upon a rigid body.

P.T.O.

- (c) If a transversal cuts the lines of action of the concurrent forces P, Q and R in A, B and C respectively R being the resultant of the two forces P and Q, show that :

$$\frac{P}{OA} = \frac{Q}{OB} = \frac{R}{OC}.$$

3. Attempt any *two* of the following : 5 each

- (a) State and prove the converse triangle law of forces.
 (b) State and prove the polygon of forces.
 (c) Three forces of magnitudes P, Q, R acting on a particle are in equilibrium and the angle between P and Q is double the angle between P and R. Show that $R^2 = (Q - P) Q$.

4. Attempt any *two* of the following : 5 each

- (a) Prove that the vector moment of a system of forces acting on a particle about any point is equal to the vector moment of their resultant about the same point.
 (b) Prove that the vector moment of the resultant couple of two couples acting upon a rigid body is the sum of the vector moments of the given couples.
 (c) Find the vector moment of a force \vec{F} of magnitude 10 units acting at a point (1, 2, 3) in the direction of the vector $2\vec{i} + \vec{j} + 2\vec{k}$ about the point (2, 3, 1).