

GUJARAT TECHNOLOGICAL UNIVERSITY**Diploma Engineering - SEMESTER-I • EXAMINATION – WINTER • 2014****Subject Code: 3300008****Date: 24-12-2014****Subject Name: Applied Mechanics****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make Suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of programmable and Communication aids are strictly prohibited.
5. Use of only simple calculator is permitted in Mathematics.
6. English version is authentic.

- Q.1** Answer any seven out of ten. **14**
1. Define kinetics and kinematics.
 2. State vector quantity with two examples.
 3. State and explain parallelogram law of forces.
 4. Define force and explain its characteristics.
 5. State analytical conditions of equilibrium for coplanar non concurrent forces.
 6. State Varignon's principle of moments.
 7. Define Centroid and Centre of Gravity.
 8. Write laws of static friction.
 9. Explain law of machine.
 10. Define kinetic and potential energy.
- Q.2** (a) State and explain Lami's theorem with sketch. **03**
- OR
- (a) State and explain polygon law of forces. **03**
- (b) Two forces 20 kN and 30 kN both tensile are acting at an angle 60° . Find magnitude and direction of the resultant force. **03**
- OR
- (b) A pull of 50 N inclined at 30° to the horizontal is necessary to move a wooden block on a horizontal table. If coefficient of friction is 0.20, find the weight of wooden block. **03**
- (c) A block weighing 100 N is resting on inclined plane which makes 20° with horizontal. Calculate the pull required parallel to plane when the block is just on point of sliding upward. Take co-efficient of friction = 0.288. **04**
- OR
- (c) A load of 100 kN is hung by means of a rope attached to a hook in a horizontal ceiling. What horizontal force should be applied so that rope makes 60° with the ceiling? Also calculate tension in rope. **04**
- (d) If two forces act at an angle 90° , resultant is $\sqrt{10}$, if they act at an angle 60° , resultant is $\sqrt{13}$. Find the two forces. **04**
- OR
- (d) Define a couple and write the properties of couple. **04**
- Q.3** (a) Explain different types of beam with sketches. **03**
- OR
- (a) State types of beam support and explain with sketches. **03**
- (b) A simply supported beam has span 5 m. It carries a point load of 200 kN at 2m from left hand support and a point load of 100 kN at 1 m from right hand support. Calculate support reactions. **03**

OR

- (b) Define (1) velocity ratio (2) mechanical advantage (3) Ideal machine. **03**
(c) State the advantages and disadvantages of friction. **04**

OR

- (c) A trapezoidal dam section has base width 5 m and top width 2 m. Its height is 16 m with one side vertical. Find centre of gravity of the dam section. **04**
(d) Find the magnitude of a push inclined at 30° to the horizontal required to move a block of weight of 500 N resting on a horizontal surface having coefficient of friction is 0.4. **04**

OR

- (d) Draw a neat sketch of simple wheel and differential axle and label its parts. Write formula for VR. **04**

- Q.4** (a) What are the different forms of energy? **03**

OR

- (a) Explain axis of reference and axis of symmetry. **03**
(b) A water tank of 5000 litres capacity is at 20 m above the ground. It is to be filled within 15 minutes from a tank at ground level by a pump. Calculate power of the pump required. **04**

OR

- (b) A woman pulls water by bucket from a well of 30 m depth. The bucket is having a small hole and is leaking uniformly. When bucket is full of water its weight is 180 N and at the top of well its weight is 100 N. Calculate the work done by a woman in pulling one bucket of water. Neglect the weight of rope. **04**
(c) ABCD is a square of 1 m side. Forces 15 N, 25 N, 35 N, 45 N and 50 N are acting respectively along AB, AD, CB, CD and BD. Find the magnitude, direction and position of resultant with respect to a point A. **07**

- Q.5** (a) Find the centroid of an angle section ISA 60×40×10 mm keeping longer leg vertical. **04**

- (b) In a lifting machine an effort of 90 N raised a load of 950 N and an effort of 450 N raised a load of 5700 N. Find the law of machine. **04**
(c) Draw neat sketch of (1) Semi Circle (2) Hemi Sphere (3) Triangle **03**
(d) Define the terms (1) Space diagram (2) Free body diagram (3) Vector diagram **03**
