Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA ENGINEERING–SEMESTER–1/2 • EXAMINATION– SUMMER 2016

Subject Code: 310030   **Date: 16/06/2016**
Subject Name: Engineering Mechanics
Time: 02:30 PM TO 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. **Each question carry equal marks (14 marks)**

Q.1 (a) Explain the following terms: **07**
(1) Scalar quantity. (2) Principle of transmissibility. (3) Resolution of force. (4) Resultant force. (5) Statics. (6) Dynamics. (7) Vector quantity.

(b) Find the magnitude of two forces such that if they act at right angle, their resultant is $\sqrt{10}$ N while if they act at an angle of 60⁰, their resultant is $\sqrt{13}$ N.   **07**

Q.2 (a) Four forces of magnitude 150 N, 200 N, 300N, 400 N are acting at and away from a point making angles 0⁰, 45⁰, 90⁰ and 150⁰ with positive direction of   x – axis respectively. Find their resultant in magnitude and direction.   **07**

(b) A horizontal beam 4 m long is simply supported at the ends and carries concentrated loads of 3 kN and 5 kN at 1 m and 3 m respectively from the left end, find the support reactions.   **07**

OR

(b) In a circus an artist weighing 600 N stands at the centre of the rope tied to the supports on each side. If the slope of the rope from the point, where the artist stands, to the supports is 5⁰, calculate the tension in the rope.   **07**

Q.3 (a) (1) Distinguish centroid and centre of gravity.   **02**
(2) Calculate centre of gravity of T-section having flange 200 mm x 20 mm and   web 300 mm x 20 mm.   **05**

(b) Four forces equal to 1 kN, 2 kN, 3 kN and 4 kN respectively are acting along four sides of a square ABCD taken in order. Find magnitude, direction and position of resultant. When the side of square is 2 m.   **07**

OR

Q.3 (a) Define: **07**
(1) Friction. (2) Angle of Friction. (3) Coefficient of friction. (4) Angle of repose. (5) Limiting friction. (6) Static friction. (7) Dynamic friction.

(b) A cylinder having diameter 16 cm, height 16 cm, supports a cone having base diameter 16 cm. Find centre of gravity of this combination.   **07**

Q.4 (a) (1) Define the following terms: **02**
(i) Displacement. (ii) Distance. (iii) Velocity. (iv) Speed.
(2) A car start from rest found to travel 50 m in 10 seconds. Find the distance travelled by the car in next 5 seconds, if the acceleration of the car is uniform.   **05**

(b) (1) Explain the following terms: **02**
(i) Horizontal range. (ii) Projectile
(2) A stone is projected in a vertical plane from the ground with a velocity of   **05**

10 m/sec at an elevation of 60° with horizontal. Calculate range, maximum height and time of flight.

<div align="center">OR</div>

Q. 4 (a) (1) Distinguish between centripetal force and centrifugal force.　　**02**

(2) A flywheel starting from rest rotates with uniform acceleration of 5 revolution/sec². Determine the speed of flywheel in radian/sec after 200 revolutions and time to complete 200 revolutions.　　**05**

(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 horse power of the pump.　　**07**

Q.5 (a) (1) State the law of conservation of energy.　　**02**

(2) A screw jack lifts a load of 20 kN by an effort of 250 N at the end of a lever arm of 50 cm. If the pitch of the screw is 10 mm. Calculate the efficiency of the screw jack at this load.　　**05**

(b) A machine lifts 200 N with an effort of 100 N and also lifts 1800 N with an effort of 500 N. State the law of machine and finds maximum MA.　　**07**

<div align="center">OR</div>

Q.5 (a) (1) What is law of machine? What are the uses of finding law of machine?　　**04**

(2) Explain reversible and non reversible machine.　　**03**

(b) For a lifting machine, the law of machine is $P = 0.02W + 1.5$ kN and the VR is 125. Find the effort lost in friction for lifting a load of 100 kN. Calculate the efficiency at this load.　　**07**

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