



MANIPAL INSTITUTE OF TECHNOLOGY,  
(A Constituent Institute of MANIPAL UNIVERSITY)  
Department of Civil Engineering



MANIPAL - 576 104, Karnataka, India.

Subject (Name & Code): Mechanics of Solids (CIE 1001)

Date of the Examination: 22-02-2016

SESSIONAL- I

Note: 1. All questions are compulsory

1. MULTIPLE CHOICE QUESTIONS

(1x5=5M)

a) The moment of a given couple is +M. the moment of its one constituent force about any point located on the line of action of other constituent is

- \*+M      \*-M      \*Zero      \*None of the above

b) A cantilever beam subjected to inclined load will have:

- \*One reaction component      \*Two reaction component      \*Three reaction component      \*Four reaction component

c) A beam AB is supported at A and B by hinged supports. If the beam is subjected to loading it is:

- \*Determinate beam      \*Indeterminate beam      \*Overhang beam      \*None of the above

d) If the resultant of coplanar concurrent force system acts along vertical direction, then,

- \* $\sum F_x = 0$       \* $\sum F_y = 0$       \* $\sum F_x = R$       \*None of the above

e) If two concurrent forces each of P act at right angles to each other, their resultant will be equal to:

- \* $P\sqrt{2}$       \* $2\sqrt{P}$       \*4 P      \* P

2. A coplanar concurrent system of five forces is shown in Figure Q2. Determine the magnitude of force P and F to maintain the equilibrium. (2 M)

3. Determine the magnitude, direction and locate the position of the resultant with respect to C for the coplanar non-concurrent force system shown in Figure Q3. (3 M)

4. A block weighing 50 kN rests on a rough horizontal plane. If a force of P=18 kN is now applied on the block as shown in Figure Q4, comment whether the block will be under the state of static, limiting or dynamic condition. Given angle of limiting friction is  $15^\circ$ . (2 M)

5. Determine the support reactions for L shaped bracket as shown in Figure Q5. (3 M)



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MANIPAL - 576 104, Karnataka, India.

Subject (Name & Code): Mechanics of Solids (CIE 1001)

Date of the Examination: 14 - 04 - 2016

**RE-SESSIONAL- I**

Note: all questions are compulsory

**MULTIPLE CHOICE QUESTIONS**

(1x5=5m)

a) A couple produces only

\*Translatory effect    \*rotational effect    \*translatory and rotational effect    \*none of these

b) Support reactions for statically determinate beams are determined by applying

\*conditions of static equilibrium    \*Lami's theorem    \*Varignon's principle    \*triangle law of forces

c) For a ladder resting against a rough vertical wall the force of friction will be

\*towards the wall    \*away from the wall    \*upwards    \*zero

d) A granular material is at the verge of rolling due to its own weight then, the angle of inclination with horizontal is

\*greater than angle of repose    \*less than angle of repose  
\*equal to angle of repose    \*equal to angle of friction

e) Lami's equation can be applied when number of unknown forces is:

\*Two    \*three    \*five    \*none of these

1. Determine the values of  $\alpha$  and  $\Theta$  so that the forces shown in Fig. Q1 will be in equilibrium (2)

2. A beam AB is supported in horizontal position by a hinge at A and a cable which runs from C over a small frictionless pulley at D as shown in Fig. Q2. Compute (i) tension T in the cable and (ii) horizontal and vertical components of the reaction at A. neglect the size of pulley at D. (3)

3. A block weighing 1500 N rests on a plane inclined at  $20^\circ$  to the horizontal as shown in Fig. Q3. If coefficient of friction between the block and the plane is 0.3, determine the magnitude of force P required to cause impending motion of block up the plane. (2)

4. For the system of coplanar non concurrent force system shown in Fig. Q4. Determine i) magnitude and direction of resultant ii) X- intercept w.r.t point A. (3)



# MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institute of Manipal University, Manipal

## Department of Civil Engineering

Subject (Name & Code): Mechanics of Solids (CIE 1001)

Date of Examination: 19/09/2016

### Sessional Test- I

.....  
Note: (i) All questions are compulsory

Total Marks: 15

(ii) Write the appropriate full answer for multiple choice questions.

| Q. No | Questions  | Marks | CO  |
|-------|--|-------|-----|
| 1A    | Which is the correct statement about law of polygon of forces? <ul style="list-style-type: none"><li>• If any number of forces acting at a point can be represented by the sides of a polygon taken in order, then the forces are in equilibrium.</li><li>• If any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon, then the forces are in equilibrium.</li><li>• If a polygon representing forces acting at a point is closed, then the forces are in equilibrium.</li><li>• If any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon taken in order, then the forces are in equilibrium.</li></ul> | 01    | CO1 |
| 1B    | The following is not a law of static friction <ul style="list-style-type: none"><li>• The force of friction depends upon the roughness of the surface</li><li>• The magnitude of the limiting friction bears a constant ratio to the normal reaction between two surfaces</li><li>• The force of friction is dependent upon the area of contact</li><li>• The force of friction always acts in a direction opposite to that in which the body tends to move</li></ul>  | 01    | CO1 |
| 1C    | A single force and a couple acting in the same plane upon a rigid body <ul style="list-style-type: none"><li>• Balance each other</li><li>• Cannot balance each other</li><li>• Produce a moment of a couple</li><li>• Are equivalent</li></ul>  | 01    | CO1 |
| 1D    | The beam at the support is neither permitted to move in any direction nor allowed to rotate in the case of _____ <ul style="list-style-type: none"><li>• Hinged support</li><li>• Fixed support</li><li>• Roller support</li><li>• Simple support</li></ul>  | 01    | CO1 |

P.T.O.



|    |  |    |     |
|----|--|----|-----|
| 1E | <p>A moment of 100 N-m about O is required to loosen the nut. The smallest magnitude of force F and the corresponding angle <math>\theta</math> that will turn the nut are _____</p> <ul style="list-style-type: none"> <li>• 250 N and <math>90^\circ</math></li> <li>• 353.55 N and <math>45^\circ</math></li> <li>• 100 N and <math>90^\circ</math></li> <li>• 56.57 N and <math>45^\circ</math></li> </ul> | 01 | CO1 |
| 2  | The 26 kN force is the resultant of two forces acting on an eye bolt. One of which is as shown in Fig.Q2. Determine the unknown force.   | 02 | CO1 |
| 3  | Determine the reactions developed at supports for the beam shown in Fig.Q3.  | 03 | CO1 |
| 4  | A uniform ladder of weight 50 kN rests against a vertical wall, so that it is inclined at an angle of $60^\circ$ with the horizontal floor. The coefficient of friction between wall and ladder is 0.25 and between floor and ladder is 0.35. When a man of weight 80 kN stands at a distance of 3 m from the foot along the ladder, it is at the verge of slipping. Determine the length of the ladder.       | 03 | CO1 |
| 5  | Determine the coordinate of centroid for the shaded area shown in Fig.Q5 with respect to the reference axis X-X shown.   | 02 | CO2 |

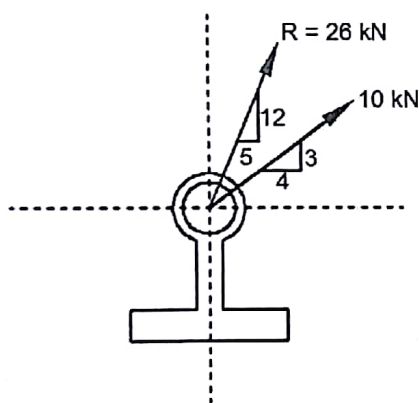
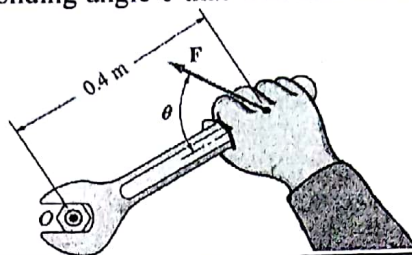


Fig.Q2

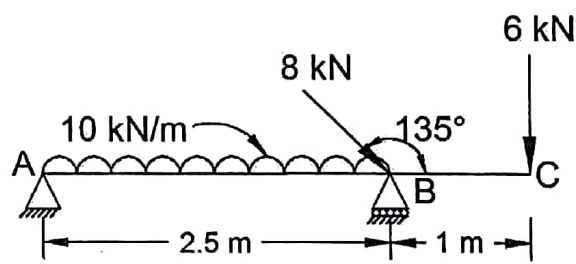


Fig.Q3

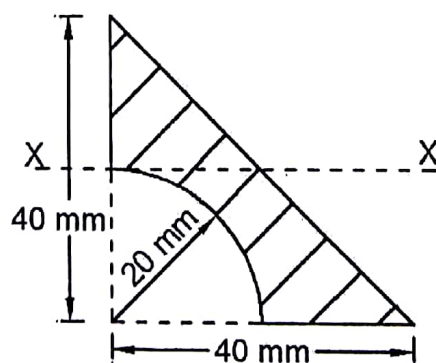


Fig.Q5



# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL  
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II SEMESTER B.TECH. INTERNAL EXAMINATIONS FEBRUARY 2018

## TEST - 1

SUBJECT: MECHANICS OF SOLIDS [CIE 1001]

Date of Exam: 09/02/2017 Time of Exam: 1.45 PM - 2.45 AM Max. Marks: 15

### Instructions to Candidates:

- ❖ Answer ALL the questions & missing data may be suitably assumed
- ❖ Write complete answers for Q.1

|    |  |   |
|----|--|---|
| 1. | Choose the appropriate answer for following multiple choice questions.   |   |
|    | <p>a) In a coplanar concurrent force system, if <math>\sum F_y = 0</math>, then the resultant is</p> <ul style="list-style-type: none"> <li>• Vertical</li> <li>• Horizontal</li> <li>• Moment of the force system</li> <li>• None of these</li> </ul>   | 1 |
|    | <p>b) A couple consists of</p> <ul style="list-style-type: none"> <li>• Two equal and like parallel forces</li> <li>• Two unequal and like parallel forces</li> <li>• Two equal and unlike parallel forces</li> <li>• None of these</li> </ul>   | 1 |
|    | <p>c) _____ is a statically indeterminate beam.</p> <ul style="list-style-type: none"> <li>• Cantilever beam</li> <li>• Overhanging beam</li> <li>• Fixed beam</li> <li>• Simply supported beam</li> </ul>   | 1 |
|    | <p>d) A simply supported beam carries a uniformly varying load throughout its span of 6 m with zero intensity at left end and 5 kN/m at right end. Then, its equivalent point load is _____ acting at _____ from left support.</p> <ul style="list-style-type: none"> <li>• 30 kN, 3 m</li> <li>• 15 kN, 2 m</li> <li>• 15 kN, 4 m</li> <li>• 30 kN, 4 m</li> </ul>                | 1 |
|    | <p>e) A ladder of length 5 m weighing 250 N is placed at <math>45^\circ</math> against a smooth vertical wall and a horizontal floor with the coefficient of friction 0.3. If the ladder is on the point of sliding, the normal reaction developed at floor is,</p> <ul style="list-style-type: none"> <li>• 250 N</li> <li>• 96.154 N</li> <li>• 75 N</li> <li>• 125 N</li> </ul> | 1 |
| 2. | A system of concurrent coplanar forces has four forces of which only three forces are shown in the <b>figure 1</b> If the resultant is a force $R = 50$ N acting as indicated, obtain the unknown fourth force.  | 2 |
| 3. | Locate the resultant of force system shown in <b>figure 2</b> with respect to A.   | 3 |
| 4. | Compute the magnitude of <b>P</b> that required to stop the motion of 300 N block shown in <b>figure 3</b> down the plane. Coefficient of friction, $\mu = 0.20$ .   | 2 |
| 5. | Determine the reactions developed at supports for the beam shown in <b>figure 4</b> .  | 3 |



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Department of Civil Engineering

MANIPAL - 576 104, Karnataka, India.

Subject: Mechanics of Solids (CIE 1001)

Date of Examination: 13-02-2017

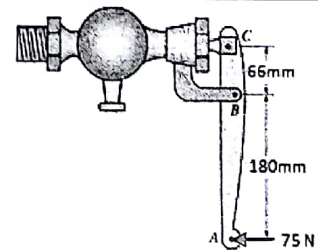
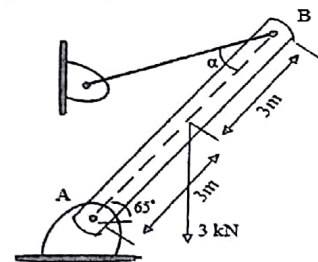
Sessional Test- I

Note: (i) All questions are compulsory

Total Marks: 15

(ii) Write the appropriate full answer for multiple choice questions.

| Q. No | Questions  | Marks | CO  |
|-------|--|-------|-----|
| 1A    | <p>A uniform 6 m boom weighing 3 kN is supported by a cable. The tension in the cable produces the same moment about the support point 'A' as that caused by the weight of the boom, but in an opposite sense. Determine tension in the cable if <math>\alpha = 35^\circ</math>.</p> <p>A. 1.122kN<br/>B. 1.105kN<br/>C. 1.547kN<br/>D. 0.774kN</p>  | 01    | CO1 |
| 1B    | <p>On a ladder resting on the smooth ground and leaning against a rough vertical wall, the force of friction will be _____</p> <p>A. Normal to the wall at its upper end<br/>B. Inclined to the wall at its upper end<br/>C. Upward at its upper end along the wall<br/>D. Downwards at its upper end along the wall</p>   | 01    | CO1 |
| 1C    | <p>A 75N force acts at point A on the high pressure water cock as shown in figure. Replace this force with a force couple system acting at point B _____</p> <p>A. 13500Nmm Clockwise moment<br/>B. 13500 Nmm Clockwise moment and 75N (<math>\rightarrow</math>)<br/>C. 13500 Nmm Anticlockwise moment and 75N (<math>\leftarrow</math>)<br/>D. 13500Nmm Clockwise moment and 75N (<math>\leftarrow</math>)</p>   | 01    | CO1 |
| 1D    | <p>According to the law of triangle of forces</p> <p>A. Three concurrent forces will be in equilibrium<br/>B. Three concurrent forces can be represented by a triangle each side being proportional to the force<br/>C. If three forces acting upon a particle are represented in magnitude and direction by the sides of a triangle taken in order, they will be in equilibrium<br/>D. If three concurrent forces in equilibrium, each force is proportional to the sine of the angle between the other two</p> | 01    | CO1 |
| 1E    | <p>The term centroid is strictly applicable in case of _____</p> <p>A. Any geometric figure<br/>B. Material body without effect of mass<br/>C. None of these<br/>D. Both A and B</p>   | 01    | CO2 |







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Department of Civil Engineering

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Subject (Name & Code): Mechanics OF Solids (CIE 1001)

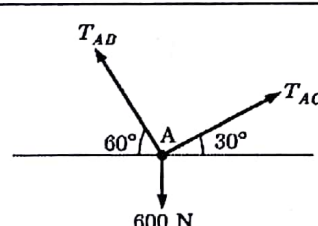
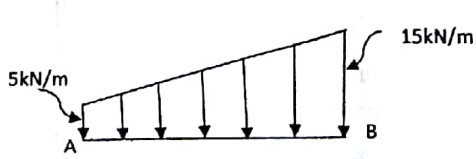
Date of Examination: 30-03-2017

Sessional Test- I (RE-TEST)

Note: (i) All questions are compulsory

Total Marks: 15

(ii) Write the appropriate full answer for multiple choice questions.

| Q. No | Questions   | Marks | CO  |
|-------|---|-------|-----|
| 1A    | According to the principle of transmissibility of forces, the effect of force upon a body is _____<br><ul style="list-style-type: none"> <li>Maximum when it acts at the center of gravity of a body</li> <li>Same at every point in its line of action</li> <li>Minimum when it acts at the center of gravity of a body</li> <li>Different at different points in its line of action</li> </ul>                              | 01    | CO1 |
| 1B    | The ratio of static friction to dynamic friction is always<br><ul style="list-style-type: none"> <li>Equal to one</li> <li>Less than one</li> <li>Greater than one</li> <li>None of these</li> </ul>  | 01    | CO1 |
| 1C    | If point A is in equilibrium under the action of the applied forces, the values of tensions $T_{AB}$ and $T_{AC}$ are respectively<br><ul style="list-style-type: none"> <li>520 N and 300 N</li> <li>300 N and 520 N</li> <li>450 N and 150 N</li> <li>150 N and 450 N</li> </ul>    | 01    | CO1 |
| 1D    | Replace the loading by an equivalent force and couple moment acting at point A.<br><ul style="list-style-type: none"> <li>Force 90kN, <math>M=473\text{kN-m}</math></li> <li>Force 90kN, <math>M=338\text{kN-m}</math></li> <li>Force 45kN, <math>M=203\text{kN-m}</math></li> <li>Force 135kN, <math>M=270\text{kN-m}</math></li> </ul>  | 01    | CO1 |
| 1E    | Which of the following lamina do not have centroid at its geometrical center?<br><ul style="list-style-type: none"> <li>Circle</li> <li>Equilateral triangle</li> <li>Right hand triangle</li> <li>None of the above</li> </ul>   | 01    | CO2 |



# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER B.TECH. INTERNAL EXAMINATIONS SEPTEMBER 2017

## TEST - 1

SUBJECT: MECHANICS OF SOLIDS [CIE 1001]

Date of Exam: 09/09/2017 Time of Exam: 8.00 AM - 9.00 AM Max. Marks: 15

### Instructions to Candidates:

- ❖ Answer ALL the questions & missing data may be suitably assumed
- ❖ Write complete answers for Q.1

|    |  |   |
|----|--|---|
| 1. | Choose the appropriate answer for following multiple choice questions.   |   |
|    | a) For a given force system, if algebraic summation of moments of all forces about a reference point is zero, then, <ul style="list-style-type: none"><li>• The system is in equilibrium</li><li>• Resultant of force system passes through the reference point</li><li>• Resultant of the force system is zero</li><li>• None of the above</li></ul>                                  | 1 |
|    | b) Number of support reactions developed for a beam fixed at both ends is, <ul style="list-style-type: none"><li>• 6</li><li>• 4</li><li>• 2</li><li>• 3</li></ul>   | 1 |
|    | c) For a given geometry, if a symmetrical axis is present then, <ul style="list-style-type: none"><li>• Centroid lies within the geometry</li><li>• First moment of elemental areas about the axis is zero</li><li>• Coordinates of centroid is completely known</li><li>• None of the above</li></ul>   | 1 |
|    | d) If a couple is acting on a plane then, <ul style="list-style-type: none"><li>• The moment of a couple is constant anywhere in the plane of couple</li><li>• The effect of a couple is changed if the couple is rotated through any angle</li><li>• The moment of a couple is dependent of the choice of moment center</li><li>• It produces both translation and rotation</li></ul> | 1 |
|    | e) When a body is about to slide down in an inclined plane without the application of an external force, the angle made by the plane with the horizontal is _____ the angle of friction <ul style="list-style-type: none"><li>• half</li><li>• equal to</li><li>• twice</li><li>• one fourth</li></ul>   | 1 |
| 2. | For a force system shown in <b>figure 1</b> if, the resultant is 500 N and passes along x – axis find 'P' and ' $\alpha$ '   | 2 |
| 3. | For a beam shown in <b>figure 2</b> determine the support reactions.   | 2 |
| 4. | Determine the force 'P' required to lift the block 'B' shown in <b>figure 3</b> upwards. Consider angle of limiting friction for all rubbing surfaces as $25^\circ$  | 3 |
| 5. | Locate the centroid of a plane geometry shown in <b>figure 4</b> , with respect to Y-Y axis  | 3 |





I SEMESTER B.TECH. INTERNAL EXAMINATIONS OCTOBER 2017

RETEST - 1

SUBJECT: MECHANICS OF SOLIDS [CIE 1001]

Date of Exam: 02/11/2017 Time of Exam: 5.45 PM - 6.45 PM Max. Marks: 15

Instructions to Candidates:

- ❖ Answer ALL the questions & missing data may be suitably assumed
- ❖ Write complete answers for Q.1

|    |   |   |
|----|---|---|
| 1. | Choose the appropriate answer for following multiple choice questions.  |   |
|    | a) In the coplanar concurrent force system if $\sum H = 0$ , then the resultant is<br><input type="radio"/> Zero <input checked="" type="radio"/> Vertical <input type="radio"/> Moment <input type="radio"/> None of these   | 1 |
|    | b) Resolution is a process<br><input type="radio"/> to find the resultant of the force system<br><input checked="" type="radio"/> to break up a force into its components<br><input type="radio"/> to find the equilibrant<br><input type="radio"/> none of these   | 1 |
|    | c) The force of friction depends on<br><input type="radio"/> Area of contact <input checked="" type="radio"/> Roughness of the surface <input type="radio"/> Both of these <input type="radio"/> None of these  | 1 |
|    | d) The moment of a force about any point is numerically equal to _____ time the area of a triangle whose base is the line representing a force and the vertex is a point about which the moment is taken.<br><input type="radio"/> Half <input type="radio"/> Same <input checked="" type="radio"/> Two <input type="radio"/> Three | 1 |
|    | e) The centroid of an equilateral triangle with each side 'a' is _____ from any of the three sides<br><input type="radio"/> $\frac{a\sqrt{3}}{2}$ <input type="radio"/> $\frac{a\sqrt{2}}{3}$ <input checked="" type="radio"/> $\frac{a}{2\sqrt{3}}$ <input type="radio"/> $\frac{a}{3\sqrt{2}}$                                    | 1 |
| 2. | Determine the reactions at supports A and B for the simply supported beam shown in Fig.1.   | 2 |
| 3. | Find the value of horizontal force P when the motion of the wedge towards right is impending. Take $\Phi=15^\circ$ and the angle of wedge $=12^\circ$ . Refer Fig.2.  | 3 |
| 4. | Two forces acting on a body are 500 N and 1000 N as shown in Fig. 3. Determine the third force F such that the resultant of all the three forces is 1000 N directed at $45^\circ$ to the X - axis.  | 2 |
| 5. | Locate the centroid of the lamina shown in Fig. 4. with respect to the axis shown.  | 3 |



# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

**Subject (Name & Code): Mechanics of Solids (CIE 1051)**

**Date of Examination: 10/04/19**

## Sessional I (additional)

.....  
Total Marks: 5

| Q. No | Questions  | Marks | CO |
|-------|--|-------|----|
|       | <b>PART A</b>  |       |    |
| 1     | Roller support of a beam in a coplanar force system offers resistance in a direction _____ to the plane of a roller<br>a) parallel b) perpendicular c) both parallel and perpendicular d) none of the above  | 0.5   | 1  |
| 2     | Which of the following conditions do not change the effect of a couple acting on a body?<br>a) Shifting of couple to a new position in its plane<br>b) Shifting of couple to a parallel plane<br>c) Rotation of couple in its plane<br>d) All of the above   | 0.5   | 1  |
| 3     | If two concurrent forces A and B acting on a point are 200 N and 300 N. What is the magnitude of resultant force, if it makes an angle of $50^\circ$ with each force?<br>a) 471.08 N b) 455.12 N c) 400.56 N d) Insufficient data  | 0.5   | 1  |
| 4     | A body experiences dynamic friction when<br>a) applied force > limiting friction b) applied force = limiting friction c) applied force < limiting friction d) applied force $\geq$ limiting friction   | 0.5   | 2  |
| 5     | For a block resting on a rough inclined plane, its angle of inclination is numerically equal to angle of limiting friction, if:<br>a) The friction generated is minimum.<br>b) The total reaction is equal to the self-weight of the body.<br>c) The block is on the verge of motion with the externally applied driving force.<br>d) None of the above. | 0.5   | 2  |
| 6     | If a loaded beam AB is supported at A and B by hinged supports, then it is:<br>a) Determinate beam b) Indeterminate beam c) either a or b d) neither a nor b   | 0.5   | 2  |
| 7     | Frictional force depends on<br>a) surface area of contact b) roughness of the surface<br>c) adhesion between surface in contact d) both b and c  | 0.5   | 2  |
| 8     | When a body is in equilibrium, Lami's theorem is applicable if the three forces acting on it are<br>a) coplanar and collinear b) coplanar and concurrent<br>c) collinear and non-concurrent d) coplanar and non-concurrent   | 0.5   | 2  |

Exam Date &amp; Time: 01-Sep-2018 (12:00 PM - 01:00 PM)



# MANIPAL ACADEMY OF HIGHER EDUCATION

Mechanics of Solids [CIE 1051 - 2018 -PHY]

Marks: 15

Duration: 60 mins.

## PART - A (MCQ)

Answer all the questions.

- 1) The forces which act at different points and have their lines of action on same plane are called
 

|                      |                      |                      |                          |       |
|----------------------|----------------------|----------------------|--------------------------|-------|
| coplanar             | non-coplanar         | coplanar non-        | non-coplanar             | (0.5) |
| 1) concurrent forces | 2) concurrent forces | 3) concurrent forces | 4) non-concurrent forces |       |
- 2) The forces whose lines of action lie along the same line are
 

|                         |                     |                                   |                      |       |
|-------------------------|---------------------|-----------------------------------|----------------------|-------|
| 1) Like parallel forces | 2) Collinear forces | 3) Coplanar non-concurrent forces | 4) None of the above | (0.5) |
|-------------------------|---------------------|-----------------------------------|----------------------|-------|
- 3) The process of obtaining the resultant of a system of forces is called:
 

|                          |                          |                        |                      |       |
|--------------------------|--------------------------|------------------------|----------------------|-------|
| 1) composition of forces | 2) resolution of a force | 3) summation of forces | 4) none of the above | (0.5) |
|--------------------------|--------------------------|------------------------|----------------------|-------|
- 4) The effect of couple is changed if
 

|  |  |   |  |       |
|--|--|---|--|-------|
| 1) couple is rotated through any angle | 2) couple is shifted to any other position | 3) couple is replaced by another pair of forces whose rotational effect is same | 4) another couple of same magnitude acts in opposite direction | (0.5) |
|--|--|---|--|-------|
- 5) If a particle acted upon by two forces of equal magnitude is in equilibrium, the angle between the two forces is
 

|              |               |                |               |       |
|--------------|---------------|----------------|---------------|-------|
| 1) $0^\circ$ | 2) $90^\circ$ | 3) $180^\circ$ | 4) $45^\circ$ | (0.5) |
|--------------|---------------|----------------|---------------|-------|
- 6) The principle where a force can be transmitted from one point to another along the line of action without change in external effect is known as
 

|                                  |                         |                          |                      |       |
|----------------------------------|-------------------------|--------------------------|----------------------|-------|
| 1) Principle of transmissibility | 2) Principle of Moments | 3) Composition of forces | 4) None of the above | (0.5) |
|----------------------------------|-------------------------|--------------------------|----------------------|-------|
- 7) A force can be shifted from one location to another to produce the same external effect using:
 

|                        |                       |                  |                      |       |
|------------------------|-----------------------|------------------|----------------------|-------|
| 1) Force Couple System | 2) Varignon's Theorem | 3) Couple System | 4) None of the above | (0.5) |
|------------------------|-----------------------|------------------|----------------------|-------|
- 8) In a coplanar concurrent force system if  $\sum H = 0$ , then the direction of the resultant is
 

|       |
|-------|
| (0.5) |
|-------|



8/31/2018

- 9) The force of friction depends on:  
 1) Inclined 2) Vertical 3) Horizontal 4) None of these (0.5)
- 10) The force of friction developed at the contact surface is always  
 1) Area of contact 2) Roughness of the surface 3) Both i) and ii) 4) None of these (0.5)
- 1) parallel to the plane and along the direction of the applied force. 2) perpendicular to the plane. 3) parallel to the plane and opposite to the direction of the motion. 4) all of the above (0.5)

**PART - B (Descriptive)**

Answer all the questions.

Section Duration: 40 mins.

- 1) Determine the magnitude of force 'F' acting on a point 'O' in a system of coplanar concurrent forces as shown in Fig.Q.1, if resultant is a pull in the horizontal right direction. Also, calculate the magnitude of resultant in the horizontal direction.

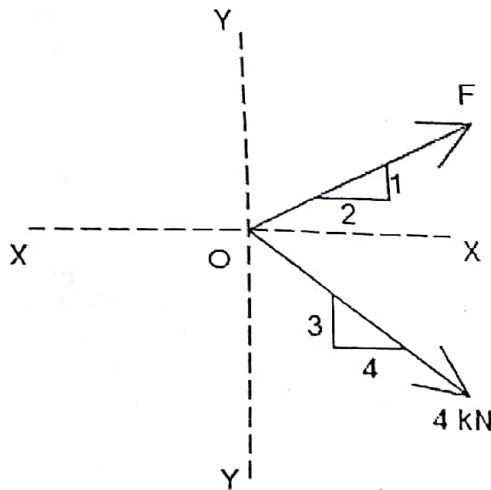


Fig.Q.1

(2)

- 2) Locate the resultant with respect to point 'A' for the force system shown in Fig.Q.2.

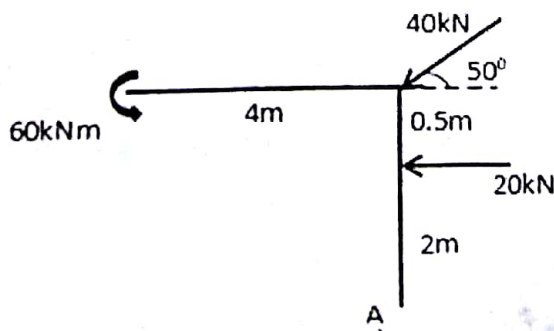


Fig.Q.2

(2)

# SCHEME OF EVALUATION



## MANIPAL ACADEMY OF HIGHER EDUCATION

Department of Civil Engineering

**Mechanics of Solids [CIE 1051 - 2018 -PHY]**

### PART - A

- 1) For a semicircle of radius R, if the Y axis lies on its axis of symmetry and X-axis is the diameter, then its centroidal coordinate (x,y) is denoted as: (0.5)

☐ (0, R)   
 ☐ (R/2, 0)   
 ☐ (0, 4R/3π)   
 ☐ (4R/3π, 0)

Correct option is: 3

- 2) The centroid of a lamina is located by using: (0.5)

☐ Lami's theorem   
 ☐ Varignon's Theorem   
 ☐ Triangle law of forces   
 ☐ Parallel axis theorem

Correct option is: 2

- 3) The centroid of an area about X axis is: (0.5)

☐  $\frac{\int x \, dA}{A}$    
 ☐  $\frac{\int y \, dA}{A}$    
 ☐  $\frac{\int x^2 \, dA}{A}$    
 ☐  $\frac{\int y^2 \, dA}{A}$

Correct option is: 2

- 4) If 'A' is the total area of a plane lamina and 'I' is its moment of inertia about an axis, then the radius of gyration about the same axis is given by, (0.5)

☐  $\sqrt{\frac{I}{A}}$    
 ☐  $\frac{I^2}{A}$    
 ☐  $\sqrt{\frac{A}{I}}$    
 ☐  $\frac{I}{A}$

Correct option is: 1

- 5) For a right angled triangle of base 'B' and height 'H', the moment of inertia with respect to its base is given by (0.5)

☐  $\frac{BH^3}{36}$    
 ☐  $\frac{HB^3}{36}$    
 ☐  $\frac{BH^3}{12}$    
 ☐  $\frac{HB^3}{12}$

Correct option is: 3

- 6) Polar moment of inertia of a rectangular lamina of width 'B' and depth 'D' about its centroid is given (0.5) by

☐  $\frac{BD}{12}(D^2 + B^2)$    
 ☐  $\frac{BD}{12}(D^2 - B^2)$    
 ☐  $\frac{BD}{3}(D^2 + B^2)$    
 ☐  $\frac{BD}{3}(D^2 - B^2)$

Correct option is: 1

- 7) The length of a wire is increased by 1 mm after the application of an axial tensile load. If the same (0.5)  
load is applied, on another wire of the same material; but of twice the length and half the radius,  
the force will produce an elongation of:

0.5 mm   2 mm   8 mm   4 mm

Correct option is: 3

- 8) The calculations of percentage elongation and percentage reduction in area of cross section for an (0.5)  
elastic material are the measures of:

Tensile strength of the material   Ductility of the material   Toughness of the material   Malleability of the material

Correct option is: 2

- 9) Modulus of rigidity of an elastic material is the ratio of: (0.5)

Tensile stress and Tensile strain   Compressive stress and Compressive strain   Shear stress and Tensile strain   Shear stress and Shear strain

Correct option is: 4

- 10) For a ductile material, in the Stress Vs. Strain plot, linear portion indicates: (0.5)

Ultimate zone   Breaking zone   Elastic zone   Yield zone

Correct option is: 3