

Reg.No. _____



Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Code : 14ME2001
Sub. Name : Engineering Mechanics

Semester : 2016-17 ODD
Duration : 3hrs
Max. marks : 100

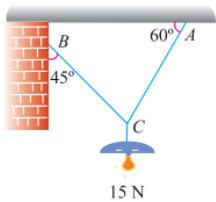
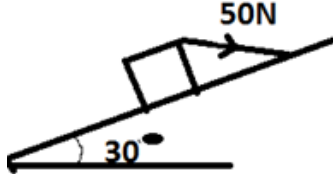
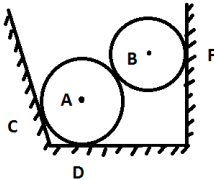
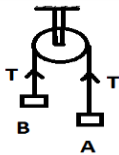
Q. No.	Questions	Cours e outco me	Marks
PART-A (40X1=40 MULTIPLE CHOICE QUESTIONS)			
1.	Which of the following statement is correct?		
	<div>a. A force is an agent which produces or tends to produce motion..</div> <div>b. A force is an agent which stops or tends to stop motion.</div> <div>c. A force may balance a given number of forces acting on a body.</div> <div>d. Both (a) and (b).</div>	1	(1)
2.	If a number of forces are acting simultaneously on a particle, then the resultant of these forces will have the same effect as produced by the all the forces. This is known as-----	1	
	<div>a Principle of physical independence of forces..</div> <div>b. Principle of transmissibility of forces.</div> <div>c. Principle of resolution of forces</div> <div>d. None of the above.</div>		(1)
3.	The moment of a force about any point is geometrically equal to... ..area of the triangle whose base is the line representing the force and vertex is the point about which the moment is taken.	1	
	<div>a. Half</div> <div>b. Same</div> <div>c. Twice</div> <div>d. None of these</div>		(1)
4.	A rod AB 2.5 m long is supported at A and B. The rod is carrying a point load of 5 kN at a distance of 1 m from A. What are the reactions at A and B.	2	
	<div>a. 2 kN, 3kN</div> <div>b. 2N , 3 N</div> <div>c. 2 kN-m,3 kN-m</div> <div>d.2Nm, 3Nm</div>		(1)
5.	Two like parallel forces of 10 N and 30 N act at the ends of a rod 200 mm long. Find magnitude of the resultant force.	1	
	<div>a. 40N</div> <div>b. 20N</div> <div>c. 300N</div> <div>d. None of the above</div>		(1)
6.	A couple consists of	2	
	<div>a. two like parallel forces of same magnitude.</div> <div>b. two like parallel forces of different magnitudes</div> <div>c. two unlike parallel forces of same magnitude.</div> <div>d. two unlike parallel forces of different magnitudes.</div>		(1)
7.	In a couple, the lines of action of the forces are.....	1	
	<div>a parallel.</div> <div>b. inclined</div> <div>c. Perpendicular</div> <div>d.) none of the above</div>		(1)
8.	According to Lami's Theorem, the three forces	1	
	<div>a Must be equal..</div> <div>b. Must be at 120° to each other.</div> <div>c. Must be both of above.</div> <div>d. May not be any of the two.</div>		(1)
9.	The Lami's Theorem is applicable only for-----	1	
	<div>a. Coplaner forces.</div> <div>b. Concurrent forces</div> <div>c. Coplaner and concurrent forces</div> <div>d. Any type of forces</div>		(1)
10.	If the sum of all the forces acting on a body is zero, then the body may be in equilibrium provided the forces are -----	1	

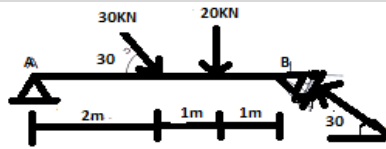
	a Concurrent.	b. Parallel	c. Like parallel	d. Unlike parallel		(1)
11.	When the car's velocity is positive and its acceleration is negative, what is happening to the car's motion?				3	
	a. the car slows down	b. the car speeds up	c. the car travels at constant speed	d. the car remains at rest		(1)
12.	The unit of product moment of inertia is same as that of -----				3	
	a. moment of inertia	b. moment of moments	c. couple moment	d. none		(1)
13.	An 80 kg man on ice skates pushes a 40 kg boy, also on skates, away from him with a force of 100N. What is the force exerted on the boy				4	
	a. 200N	b. 100N	c. 50 N	d. 40 N		(1)
14.	The frictional force present for a body of 'A' of weight 4N is 2N, on a rough surface. If, on the same rough surface another body 'B' which has three times the weight of the body 'A', determine the frictional force				4	
	a. 12N	b. 2N	c. 4N	d. none of the options		(1)
15.	A white ball of mass 1kg moving with initial speed of 0.5 m/s collides with a stationary red ball of same mass, they move forward making an angle of 90° between their path. Their speed is -----				4	
	a. 1m/s	b. 0.354 m/s	c. 2m/s	d. 3m/s		(1)
16.	When a body (A) of infinitesimally small mass collides with a stationary body (b) of very high mass, identify the correct statement from the following, assuming that the collision is perfectly elastic				3	
	a. velocity of A is reversed, B remains stationary	b. Velocity of A is reversed, B starts to move with half the velocity of A	c. Velocity of A becomes zero and B remains stationary	d. Velocity of A becomes zero and B starts to move with half the velocity of A		(1)
17.	In a perfectly inelastic collision, kinetic energy				3	
	a. Totally disappears	b. Is increased	c. Is decreased	d. None of the above		(1)
18.	A body is projected at such an angle that the horizontal range is three times the greatest height. What is the angle of projection					
	a. 53.1°	b. 43.8°	c. 34.5°	d. 57.2°	3	(1)
19.	A particle is thrown with a velocity of 5m/s at an angle of elevation of 60° to the horizontal. What is the velocity of another particle thrown at an angle of elevation of 45° which will have equal horizontal range					
	a. 6.12 m/s	b. 5.6 m/s	c. 4.82 m/s	d. 3.34 m/s		(1)
20.	An object tied with string and is hung vertically is an example of				3	
	a. parallel force	b. unlike parallel force	c. like parallel force	d. tension in string		(1)
21.	Maximum Resistance offered by the body is called.....				3	
	a. Limiting friction	b. Resistance	c. Retardation	d. Range		(1)
22.	When _____ the body is in equilibrium and at rest				3	
	a. $F = \mu_s N_R$	b. $F > \mu_s N_R$	c. $F < \mu_s N_R$	d. $F > \mu_s N_R$		(1)
23.	Negative acceleration is also called as				3	
	a. Declination	b. Dip	c. Retardation	d. . speed		(1)
24.	Speed is a _____ quantity				1	
	a. scalar	b. vector	c. polar	d. cartesian		(1)
25.	A car starts from rest with uniform acceleration of 0.6 m/s ² , what is its initial velocity--				3	

.	-----				
	a. 0	b. 0.6 m/s	c. 6 m/s	d. m/s	(1)
26	The velocities of the two colliding bodies, before collision are not collinear with the line of impact. then impact is -----				3
.	a. central	b. direct	c. oblique	d. none	(1)
27	The distance travelled by the car at uniform speed-----				4
.	a. $ut + \frac{1}{2}at^2$	b. $ut - \frac{1}{2}at^2$	c. ut	d. u	(1)
28	Time taken by the particle to reach maximum height-----				4
.	a. $t = v/g$	b. $t = u/g$	c. $t = g/v$	d. $t = g/u$	(1)
29	If the force and work done are at right angles then the work done is-----				3
.	a. 0	b. maximum	c. minimum	d. any value other than zero	(1)
30	If the body overcomes the limiting friction then it is in -----motion				3
.	a. linear	b. impending	c. curvilinear	d. none	(1)
31	D'Alembert's principle states that pushing force is equal to -----				4
.	a) ma	b) $-ma$	c) 0	d) maximum	(1)
32	Kinetics is a branch of mechanics dealing with-----				4
.	a) Motion and force	b) motion without force	c) force without motion	d) all the above	(1)
33	Horizontal distance travelled in nth sec is given by S_n is equal to-----				4
.	a) $u + a/2 (n-1)$	b) $u - a/2 (n-1)$	c) $u + a/2 (2n-1)$	d) $u + a (2n-1)$	(1)
34	The force of friction is always in _____ direction of the impending motion				4
.	a) Perpendicular	b) opposite	c) same	d) parallel	(1)
35	A force of F forms an angle $\theta_x, \theta_y, \theta_z$ degrees respectively with x, y, z axes. Write the force in vector form.				1
.	a. $F(\cos\theta_z i + \cos\theta_x j + \cos\theta_y k)$	b. $F(\cos\theta_x i + \cos\theta_y j + \cos\theta_z k)$	c. $F(\sin\theta_x i + \sin\theta_y j + \sin\theta_z k)$	d. None of the above	(1)
36	A force of 400N forms an angle 60, 45, 120 degrees respectively with x, y, z axes. Write the force in vector form.....				1
.	a. $200i + 282.84j + 200k$	b. $200i + 282.84j - 200k$	c. $-200i + 282.84j + 200k$	d. $282.84i + 200j - 200k$	(1)
37	Equation of motion of a particle moving in straight line with variable acceleration $S = 15t + 3t^2 - t^3$, what is the velocity at start.....				4
.	a. -1m/s	b. 5 m/s	c. 3 m/s	d. 15 m/s	(1)
38	The suitability of kinetic problems involving force, velocity and displacement can be solved by--- -----				3
.	a. Kinetic method	b. Impulse-momentum method	c. Friction method	d. Work energy method	(1)
39	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 deg with each force?				1
.					

	a. 471.08 N	b. 455.12 N	c. 400.56 N	d. Insufficient data		(1)
40	Reason behind bicycle moving in forward direction is due to -----					
	a. First law of force	b. Second law of force	c. Third Law of force.	d. Law of transmissibility		(1)

PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)

41.	<p>An electric light fixture weighing 15 N hangs from a point C, by two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal as shown in Fig.</p> 	1	(5)
42.	Explain in detail about the conditions of equilibrium?	1	(5)
43.	<p>A block of weight 150N is resting on a rough inclined plane as shown in the fig. The block is tied up by a horizontal string, which has a tension of 50N. Find (i) the frictional force on the block (ii) the normal reaction of the inclined plane (iii) the coefficient of friction between the surfaces of contact.</p> 	3	(5)
44.	Derive the resultant by using parallelogram law of forces.	1	(5)
45.	<p>Draw the free body diagram of the figure.</p> 	1	(5)
46.	<p>A bullet of mass 30 gram is moving horizontally with a velocity of 450 m/s and strikes a wooden block of weight 45 N, resting on a horizontal floor. The bullet is embedded in the block and then both block and bullet move as a single unit. Calculate the distance moved. Take $\mu = 0.45$.</p>	4	(5)
47.	<p>Two blocks A and B of weights 80N and 60N are connected by a string passing through a smooth pulley as shown. Calculate the acceleration of the body and the tension in the string.</p> 	4	(5)
48.	<p>A force F has the components $F_x = 150\text{N}$, $F_y = -200\text{N}$, $F_z = 300\text{N}$. Determine its magnitude F and the angle made by F with three coordinate axes.</p>	1	(5)
49.	Determine the supports and reactions of the given figure.	2	(5)



50. A car of mass 150kg is travelling on a horizontal track at 36km/hr. determine the time needed to stop the car. The co. efficient of friction between the tyres and the road is 0.45.

3 (5)

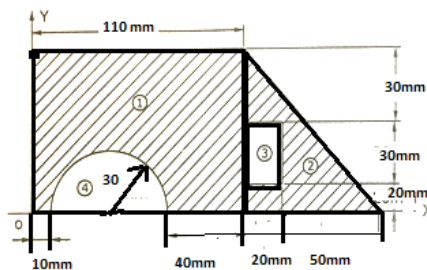
PART C(2 X 10 = 20 MARKS) (ANSWER ANY TWO)

51. The following forces act at a point :
 (i) 20 N inclined at 30° towards North of East,
 (ii) 25 N towards North,
 (iii) 30 N towards North West, and
 (iv) 35 N inclined at 40° towards South of West.
 Find the magnitude and direction of the resultant force.

1 (10)

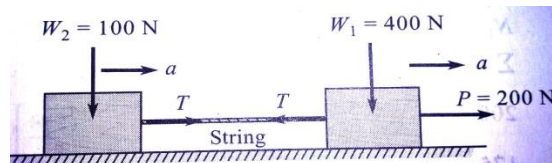
52. Locate the centroid of the sectioned area shown in figure.

2 (10)



53. Two weights W_1 and W_2 are connected by a string and move along a horizontal plane under the action of force $P = 200\text{N}$ applied horizontally to the weight W_1 . the coefficient of friction between the weights and the plane is 0.25. determine the acceleration of the weights and tension in the string.

3 (10)



ALL THE BEST