



B.E/B.TECH DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2013)

Second Semester

U13MET201: ENGINEERING MECHANICS

(Common to AE/AUE/CE/ME/MCE/TXT)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Which of the following is a vector quantity
A. Energy B. Mass C. Momentum D. Angle
2. Scalar quantity has ----- only
3. If a number of forces are acting at a point, their resultant will be inclined at an angle θ with the horizontal, such that
A. $\tan \theta = \frac{\sum H}{\sum V}$ B. $\tan \theta = \frac{\sum V}{\sum H}$ C. $\tan \theta = \frac{\sum V_x}{\sum H}$ D. $\tan \theta = \frac{\sum V_x}{\sum V}$
4. Single force which produce the same effect as produced by a number of forces jointly in a system is known as _____
5. Which of the following is the area for quadrant
A. $\frac{\pi r^2}{2}$ B. πr^2 C. $\frac{\pi r^2}{4}$ D. πr
6. A body has ----- number of centre of gravity.
7. For open belt drive the angle of contact ϑ is
A. $(180-2\alpha)$ B. $(180+2\alpha)$ C. $(90-2\alpha)$ D. $(90+2\alpha)$
8. Coefficient of static friction is ----- than coefficient of dynamic friction
9. The motion of a particle round a fixed axis is
A. Rotary B. Translatory C. Circular D. Translatory as well as Rotary
10. For maximum range, angle of projection $\alpha =$ -----.

Answer All Questions:-

PART B (10 x 2 = 20 Marks)

11. State the necessary and sufficient condition for static equilibrium of a particle in two

dimensions?

12. What is a free body diagram?
13. Name at least any four types of support in two dimension truss.
14. State varignon's theorem?
15. Differentiate centroid and centre of gravity.
16. State parallel axis theorem?
17. Enlist the factors that necessitates limiting friction.
18. State the laws of coloumb friction.
19. Write the characteristic equation for impulse momentum principle.
20. The motion of a particle is defined by the relation $s = t^3 - 16t^2 - 22$, s is in meters and t is in seconds. Determine the acceleration of the particle at $t = 3$ seconds.

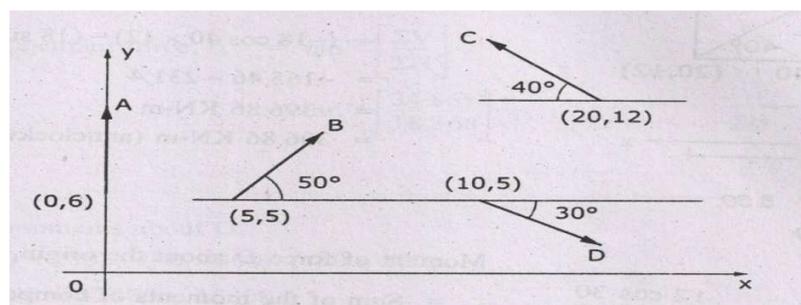
PART C (5 x 14 = 70 Marks)

Q. No 21 is compulsory

21. Five forces are acting on a particle. The magnitude of the forces are 300 N, 600 N, 700 N , 900 N and P and their respective angles with the horizontal are 0° , 60° , 135° , 210° , and 270° . If the vertical component of all the forces is -1000 N, find the value of P. Also calculate the magnitude and the direction of the resultant, assuming that the first force acts towards the point, while all the remaining forces act away from the point.

22. a) A system of four forces A, B, C, D of magnitudes 10 KN, 15 KN, 18 KN and 12 KN acting on a body are shown in rectangular co-ordinates as shown in fig1. Find the moments about the origin.

Fig: 1



(OR)

- b) Determine the support reactions of the beam shown in fig: 2

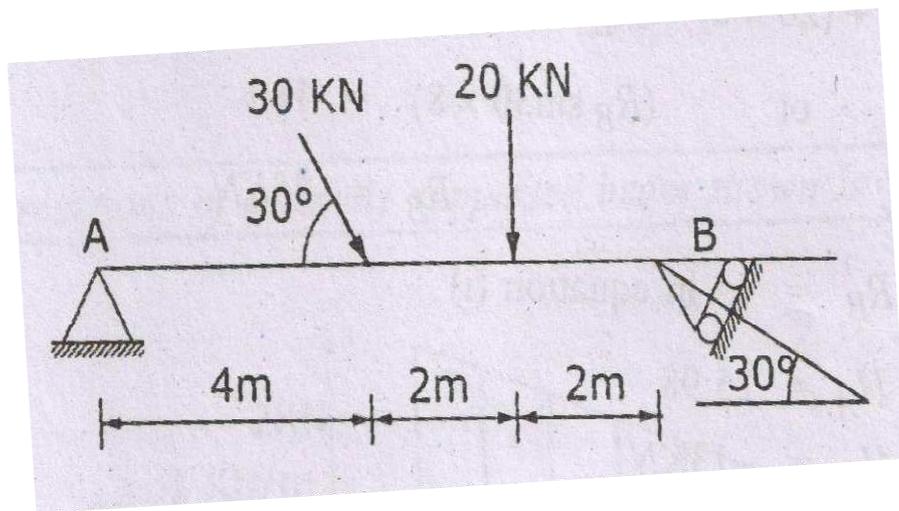


Fig: 2

23. a) Find the Centroid of the lamina shown in fig3. All dimensions are in mm.

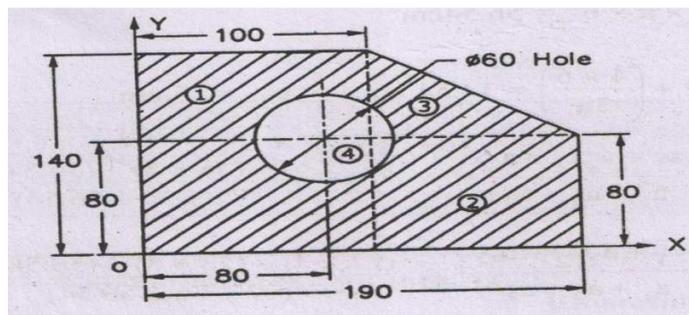


Fig:3
(OR)

b) Find the moment of inertia of plane area shown below in the fig:4 about its Centroidal axes.

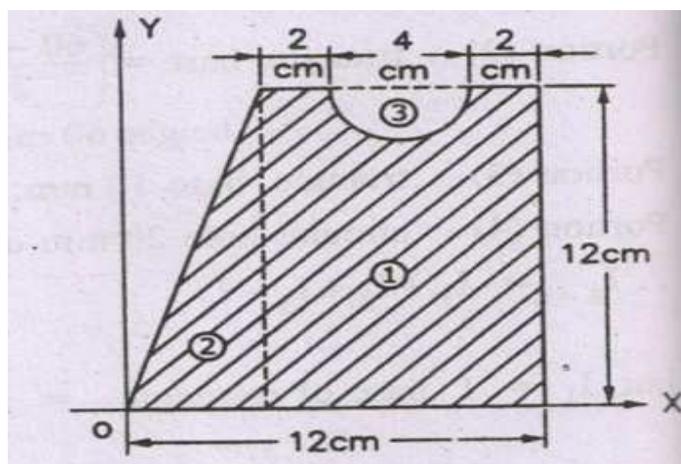


Fig: 4

24. a) What should be the value of the angle θ so that motion of the 390 N block impends down the plane? The co-efficient of friction μ for all surfaces is $1/3$ as shown in fig: 5.

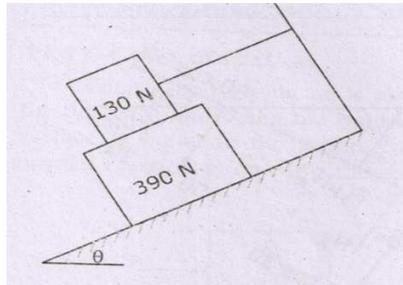


Fig:5
(OR)

- b) A block overlying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge as shown in fig: 6. Assuming co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force to be applied to raiser the block.

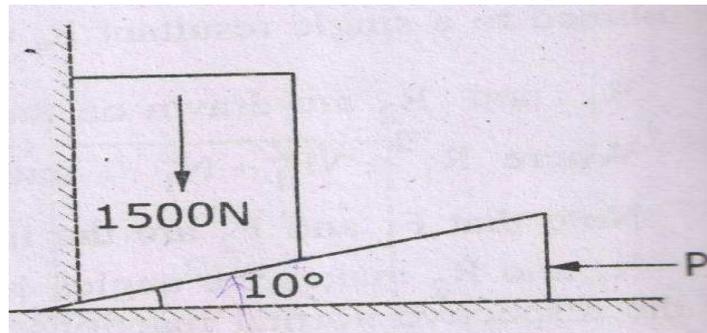


Fig: 6

25. a) Two blocks A and B of weight 80 N and 60 N are connected by a string, passing through a smooth pulley, as shown in fig7. Calculate the acceleration of the body and the tension in the string.

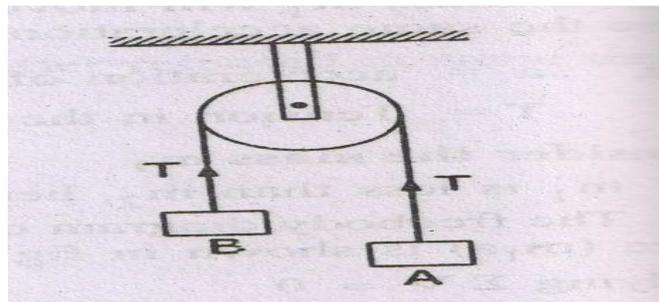


Fig: 7
(OR)

- b) A car of mass 150 kg is travelling on a horizontal track at 36 km / hour. Determine the time needed to stop the car. The co-efficient of friction between the tyres and the road is 0.45.
