KUMARAGURU
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Register Number: …...…….

B.E/B.TECH DEGREE EXAMINATIONS: DEC 2014

(Regulation 2013)

Second Semester

U13MET201:ENGINEERING MECHANICS

(Common to AERO/AUTO/CE/ME/MCT&TXT)

Time : Three Hours **Maximum Marks: 100**

Answer ALL Questions :-

PART – A (10 x 1 = 10 Marks)

1. If three coplanar forces acting at a point be in equilibrium, then each force is proportional to the sine of angle between the other two forces. The above statement is a _____.
2. If the cross product of two vectors is zero, then the vectors are.
   a) Parallel to each other b) Resultant force
   c) Concurrent force d) Perpendicular to each other
3. In beam, one end is fixed and other end is free is called as _____.
4. Two parallel, non collinear forces of equal magnitude having opposite senses are known as _____.
   a) moment b) couple
   c) centroid d) moment of inertia
5. The point at which the entire weight of the body is assumed to be concentrated is called as _____.
6. The moment of inertia of the lamina or plane about the axis perpendicular the plane of the section _____.
   a) Mass moment of inertia b) Centroid
   c) Polar moment of inertia d) Centre of gravity
7. Any plane motion which is neither a rotation nor a translation is referred to as a _____.
8. What is the acceleration of a body starts from rest having a force and mass of 80 N and 15 kg respectively?
   a) 6.33 m/s^2 b) 5.33 m/s^2
   c) 4.33 m/s^2 d) 7.33 m/s^2

9. The work done of a man having a mass of 80 kg is able to run up a 7m high flight of stairs in 5 seconds is _____

10. What is the velocity of a body which falls from rest and it has fallen through a height of h metres?

a) $V = (2gh)^2$ b) $V = (2gh)^{1/2}$

c) $V = (2gh)^{1/4}$ d) $V = (2gh)^3$

Answer ALL Questions :-

PART- B (10 x 2 = 20 Marks)

11. State the principle of transmissibility of forces.
12. Define coplanar forces.
13. Distinguish between particle and rigid body.
14. List out the different types of beams.
15. State the Parallel axis theorem.
16. What is meant by Centre of gravity?
17. Write down the equations of motions of a particle under gravitation.
18. What is meant by impulsive force?
19. Define Co-efficient of friction.
20. State the law of conservation of energy.

PART – C (5 x 14 = 70 Marks)

21. (i) Define the frictional force and state the laws of friction. (8)

(ii) The car takes 10 seconds to cover 40 metres and 13 seconds to cover 58 m. Find the uniform acceleration of the car and its velocity at the end of 15 seconds. (6)

22. (a) State and explain the following:

(i) Parallelogram law

(ii) Triangle law

(iii) Lami's Theorem

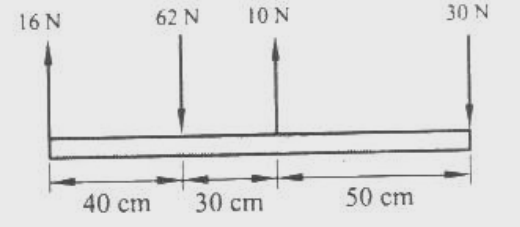
(OR)

(b) (i) A force of 200 N is directed along the line drawn from the point A (8, 2, 3) m to the point B (2, -4.4, 7.8) m. Find the magnitude of the moment of this force about z -axis. (7)

(ii) Two forces 60 N and 65 N acts on a screw at an angle of 25° and 85 ° from the base. Determine the magnitude and direction of their resultant. (7)

23. (a) (i) A simply supported beam of span 10m carries uniformly varying load from zero at end A to 800 N/m at end B. Calculate the reactions at the two ends of the support. (7)

(ii) A rigid bar is subjected to a system of parallel forces as shown in figure. (7)



Reduce this system to a

(i) Single force

(ii) a single force moment at A

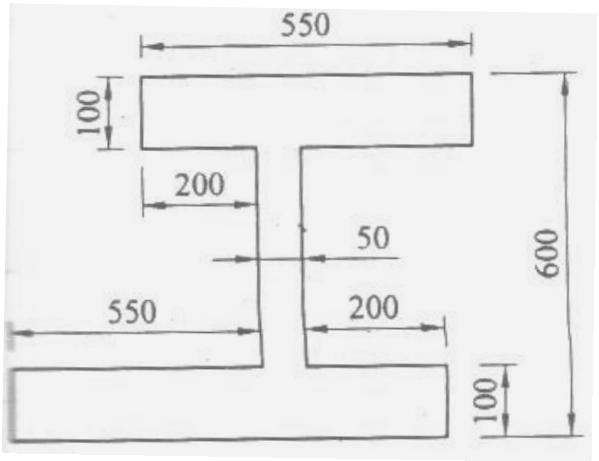
(iii)a single force moment at B

(OR)

23. (b) (i) State and Prove Varignon's theorem. (10)

(ii) State the Analytical conditions for equilibrium of coplanar forces in a plane. (4)

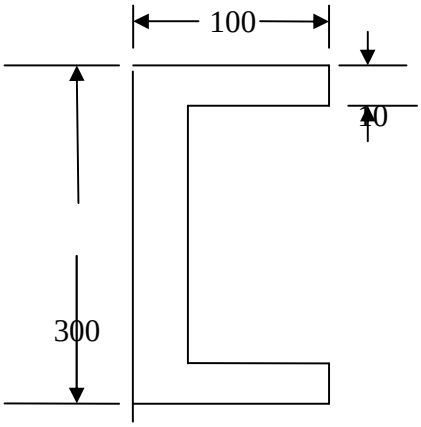
24. (a) For the section shown below locate the horizontal and vertical centroid axis. (All Dimensions are in mm)



(OR)

24. (b) (i) State and Prove Parallel axis theorem. (10)

(ii) A channel section is of size 300 mm x 100 mm x 10 mm overall. The bases as well as the flanges of the channel are 100 mm thick as shown in figure. Determine the centre of gravity. (4)



25. (a) (i) A particle moves x-axis and its position is expressed as $x=3.5t^3-7t^2$ where 'x' is in metres and 't' is in seconds. (8)

(i) Determine the position at t=0, 1, 3, 7 seconds.

(ii) Determine the displacement during t=3s to t=7s.

(iii) Find the average velocity during t=3s to t= 7s and instantaneous velocity at t=3s, t=7s.

(ii) A man having a mass of 80 kg is able to run up a 7m high flight of stairs in 5 seconds. Determine the power generated. Also find the time needed for a 100 watts bulb to burn to spend the same amount of energy. (6)

(OR)

25. (b) (i) A mass 6 kg travelling to the right with a speed of 7.5 m/s collides with another mass 12 kg, travelling to the left with a speed of 25m/s. If the coefficient of restitution is 0.6, find the velocities of the particles after collision and loss in kinetic energy. What is the impulse acting on either particle during the impact? (8)

(ii) A car is moving with a velocity of 20 m/s. The Co- efficient of friction between road and tyre is 0.5. If the brakes are suddenly applied, find the distance upto which the automobile slides before comes to rest. (6)

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