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Subject Name & Code : Engineering Mechanics (23PC104C) Exam Name : Q1

1. Which of the following statement is true? [A]

A) A scalar is any physical quantity that can be completely specified by its magnitude
B) A vector is any positive or negative physical quantity that can be completely specified by its magnitude
C) A scalar is any physical quantity that requires both a magnitude and a direction for its complete description
D) A scalar is any physical quantity that can be completely specified by its direction

2. For two vectors defined by an arrow with a head and a tail. The length of each vector and the angle between them represents: [B]

A) Their magnitude's square and direction of the line of action respectively
B) Their magnitude and direction of the line of action respectively
C) Magnitude's square root and direction of the line of action respectively
D) Magnitude's square and the ratio of their lengths respectively

3. If a vector is multiplied by a scalar: [C]

A) Then its magnitude is increased by the square root of that scalar's magnitude
B) Then its magnitude is increased by the square of that scalar's magnitude
C) Then its magnitude is increased by the amount of that scalar's magnitude
D) You cannot multiply the vector with a scalar

4. All the vectors quantities obey: [D]

A) Parallelogram law of addition
B) Parallelogram law of multiplication
C) Parallelogram law of addition of square root of their magnitudes
D) Parallelogram law of addition of square of their magnitudes

5. A force vector with magnitude R and making an angle α with the x-axis is having its component along x-axis and y-axis as: [A]

A) Rcosine (α) and Rsine(α)
B) Rcosine (180-α) and Rsine(α)
C) Rcosine (180-α) and Rsine(180+α)
D) Rcosine (α) and Rsine(180+α)

6. Dividing the X-axis component and the Y-axis component of the vector making an angle with Y-axis α will give us. [B]

A) Cot α
B) Tan α
C) Sec α
D) 1

7. The magnitude of the resultant of the two vectors is always_____ [C]

A) Greater than one of the vector's magnitude
B) Smaller than one of the vector's magnitude
C) Depends on the angle between them
D) Axis we choose to calculate the magnitude

8. If two equal vector forces are mutually perpendicular then the resultant force is acting at which angle as compared to one of the vector? [A]

A) 45 degree B) 90 degree C) 180 degree D) 0 degree

9. What is the direction of the resultant vector if two vectors having equal length is placed in the Cartesian plane at the origin as, one being parallel to and heading towards positive x-axis and the other making 165 degree with it and heading in the opposi [C]

A) It is either in the 1st quadrant or in the 2nd quadrant B) It is either in the 1st quadrant or in the 3rd quadrant C) It is either in the 1st quadrant or in the 4th quadrant D) Only in the 1st quadrant

10. Force vector R is having a_____ [A]

A) Length of R and a specific direction B) Length of R C) A specific direction D) Length of magnitude equal to square root of R and a specific direction

11. In right handed coordinate system which axis is considered to be positive? [A]

A) The thumb is z-axis, fingers curled from x-axis to y-axis B) The thumb is x-axis, fingers curled from z-axis to y-axis C) The thumb is y-axis, fingers curled from x-axis to z-axis D) The thumb is z-axis, fingers curled from y-axis to x-axis

12. If A is any vector with Ai + Bj + Ck then what is the y-axis component of the vector? [A]

A) B units B) A units C) C units D) Square root of a sum of squares of the three, i.e. A, B and C

13. Which statement is right for force vector F = Ai + Bj + Ck? [C]

A) In rectangular components representation of any vector we have vector F = Ai + Bj + Ck B) In rectangular components representation of any vector we have vector F = Ax + By + Cz C) In rectangular components representation of any vector we have vector F = Fx + Fy + Fz D) In rectangular components representation of any vector we have vector F = Fi + Fj + Fk

14. What is the magnitude of the Cartesian vector having the x, y and z axis components to be A, B and C? [A]

A) Square root of the squares each A, B and C B) Square of the squares each A, B and C C) Cube root of the squares each A, B and C D) Cube of the squares each A, B and C

15. What is cosα for force vector F = Ax + By +Cz (Given α, β and γ are the angles made by the vector with x, y and z axis respectively)? [C]

A) B/F B) C/F C) A/F D) 1

16. What is the sum of squares of the cosine angles made by the force vector with the coordinate axis? [A]

A) 1 B) ½ C) 2 D) 3

17. What is the x-axis component of the force vector Ai + Bj +Ck with magnitude equal to F? [C]

A) B B) C C) Fcosα D) Fcosβ

18. For a vector F, Fcosβ is equal to zero. What does this refer? [B]

A) X-axis component is zero B) Y-axis component is zero C) Z-axis component is zero D) β = 180˚

19. Which statement is correct about the vector F? [A]

A) F= Fcos β + Fcos α + Fcosγ B) F= Fsin β + Fcos α + Fcosγ C) F= Fcos β + Fsin α + Fcosγ D) F= Fcos β + Fcos α + Fsinγ

20. Which is true? [C]

A) ∑F = ∑Fx + ∑Fy + ∑Fz B) ∑F = -(∑Fx + ∑Fy + ∑Fz) C) ∑F = ∑Fxi + ∑Fyj + ∑Fzk D) ∑F = -(∑Fxi+ ∑Fyj + ∑Fzk)

21. Express the vector in the Cartesian Form, if the angle made by it with y and z axis is 60˚ and 45˚ respectively. Also, it makes an angle of α with the x-axis. The magnitude of the force is 200N. [A]

A) 100i + 100j + 141.4k N B) 100i – 100j + 141.4k N C) 100i + 100j – 141.4k N D) 100i – 100j – 141.4k N

22. What is the magnitude of the vector, 12i – 8j – 24k? [B]

A) 18 B) 28 C) 38 D) 48

23. The coordinate of the Force vector AB is A (2, 0, 2) and B (-2, 3.46, 3). What are its directions? [A]

A) -0.742i + 0.643j + 0.186k B) 0.742i – 0.643j – 0.186k C) -0.742i – 0.643j + 0.186k D) -0.742i + 0.643j – 0.186k

24. The coordinate of the Force vector AB is A (2, 0, 2) and B (-2, 3.46, 3). It has a magnitude of 750N. Which is the best Cartesian representation of the vector AB? [A]

A) -557i + 482j + 139k N B) -557i – 482j + 139k N C) -557i + 482j – 139k N D) 557i – 482j – 139k N

25. A force vector is along 4i – 4k direction and has a magnitude 100N and another force vector is along 4i +2j -4k and has a magnitude of 120N. What is the resultant of both forces? [D]

A) 80i + 40j – 80k N B) 80i – 40j – 80k N C) 151i + 40j – 80k N D) 151i+ 40j – 151k N

26. Effect of a force on a body depends upon [D]

A) Magnitude B) direction C) position or line of action D) all of the mentioned

27. For two vectors A and B, what is A.B (if they have angle α between them)? [A]

A) |A||B| cosα B) |A||B| C) √(|A||B|) cosα D) |A||B| sinα

28. Which statement is right? [A]

A) Communitive law: A.B =B.A B) Multiplicative law: a(A.B) = Ax(aB) C) Multiplicative law: A.(B+D) = (A.B) + (A.D) D) Communitive law: a(A.B) = A.(aB)

29. What is Distributive law? [C]

A) A.B =B.A B) a(A.B) = A.(aB) C) A.(B+D) = (A.B) + (A.D) D) a(A.B) = AxB

30. What is multiplication law? [B]

A) A.B =B.A B) a(A.B) = A.(aB) C) A.(B+D) = (A.B) + (A.D) D) a(A.B) = AxB

31. Determine the magnitude of the force F = 300j parallel to the direction of AB? [B]

A) 155N B) 257.1N C) 200N D) 175N

32. According to principle of moments [B]

A) if a system of coplanar forces is in equilibrium, then their algebraic sum is zero B) if a system of coplanar forces is in equilibrium, then the algebraic sum of their moments about any point in their plane is zero C) -the algebraic sum of the moments of any two forces about any point is equal to moment of theiwesultant about the same point D) positive and negative couples can be balanced

33. What is {(i.i) + (-i.j) + (-k.k) + (k.i)}.(Ai +Bj + Cz)? [B]

A) 1 B) 0 C) A + B + C D) -1

34. According to Lami's theory [D]

A) three forces acting at a point will be in equilibrium B) three forces acting at a point can be represented by a triangle, each side being proportional to force 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 D) if three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two

35. Mathematically, for two vectors A and B of any magnitude, the cross product of both, i.e. AxB = given by: [A]

A) |A||B|sinØ B) |A||B| C) |A||B|cosØ D) |A||B|sin(180°+Ø)

36. Which among the following is the distributive law for the cross product of three vectors? [A]

A) Px(Q+S) = (PxQ) + (PxS) B) Px(QxS) = (PxQ) + (PxS) C) Px(QxS) = (PxQ) x (PxS) D) Px(Q+S) = (PxQ) + (QxS)

37. Which statement is true? (For three vectors P, Q and R) [B]

A) Associative law for cross product: (PxQ)xS = Px(QxS) B) Associative law for cross product: (PxQ)xS ≠ Px(QxS) C) Associative law for cross product: (PxQ)xS > Px(QxS) D) Associative law for cross product: (PxQ)xS < Px(QxS)

38. If a rigid body is in equilibrium under the action of three forces, then [D]

A) these forces are equal B) the lines of action of these forces meet in a point C) the lines of action of these forces are parallel D) the lines of action of these forces meet in a point & the lines of action of these forces are parallel

39. If a number of forces act simultaneously on a particle, it is possible [B]

A) not a replace them by a single force B) to replace them by a single force C) to replace them by a couple D) To replace them by a couple and a force.

40. The _____ forces do not cause the rotation. [B]

A) Non-concurrent B) Concurrent C) Parallel D) Non-Parallel

41. What is Varigon's Theorem? (M = Moment, F= Force vector, R= Radius vector) [A]

A) M = R x F (F = F1 + F2 + F3 + … vectorially adding all the forces) B) |A||B|sinØ C) (AxB)xS ≠ Px(QxS) D) Px(Q+S) = (PxQ) + (PxS)

42. What is the mixed triple product of three vectors? [A]

A) S.(PxQ) B) Sx(PxQ) C) S.(P.Q) D) Sx(P.Q)

43. According to law of triangle of forces [C]

A) three forces acting at a point will be in equilibrium B) three forces acting at a point can be represented by a triangle, each side being proportional to force C) if three forces acting upon a patticle are represented in magnitude and direction by the sides of a triangle, taken in order, they will be in equilibrium D) if three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two

44. Angle of friction is the [A]

A) angle between normal reaction and the resultant of normal reaction and the limiting friction
B) ratio of limiting friction and normal reaction
C) the ratio of minimum friction force to the friction force acting when the body is just about to move
D) the ratio of minimum friction force to friction force acting when the body is in motion

45. What does the moment of the force measure? [A]

A) The tendency of rotation of the body along any axis
B) The moment of inertia of the body about any axis
C) The couple moment produced by the single force acting on the body
D) The total work is done on the body by the force

46. If a car is moving forward, what is the direction of the moment of the moment caused by the rotation of the tires? [C]

A) Moment of inertia
B) Moment of couple
C) Torque
D) Force

47. If you are getting to know about the direction of the moment caused by the force applied on the body by using your wrist and curling it in the direction of the rotation then which of the following is not right? [B]

A) The thumb represents the direction of the force
B) The thumb represents the direction of the moment
C) The fingers represent the direction of the force
D) The direction in which you curl your wrist is towards the direction of the distance from point of contact of force to the axis of rotation

48. The moment axis, force and the perpendicular distance in the moment of the force calculation is lying in_____ [A]

A) Two planes perpendicular to each other
B) A single plane in the direction of the force
C) A single plane in the direction of the perpendicular distance
D) A single line in the direction of the force

49. If the rotation is clockwise in this page, suppose, then in which direction will the thumb project if you curl your hand in the same direction of the rotation? [B]

A) It will point to the direction perpendicular to the plane of the paper and towards you
B) It will point to the direction perpendicular to the plane of the paper and away from you
C) It will point to the direction parallel to the plane of the paper and towards right
D) It will point to the direction parallel to the plane of the paper and towards left

50. Which of the following is true? [A]

A) Total moment of various forces acting on the body is the vector sum of all moments
B) Total moment of various forces acting on the body is the algebraic sum of all moments
C) Total moment of various forces acting on the body is always zero
D) Total moment of various forces acting on the body is the vector sum of all moments which is perpendicular to each other forces

51. The resultant force acting in the couple is _____ [A]

A) Zero
B) Infinite
C) Twice the magnitude of the single force
D) Half the magnitude of the single force

52. The distance between the forces acting in the couple is _____ [C]

A) Infinity B) Zero C) A finite distance D) A circular loop

53. A couple moment is a _____ vector. [D]

A) Gradient B) Scalar C) Del D) Free

54. The resultant couple moment is _____ sum of various couples acting on the body. [A]

A) Vector B) Scalar C) Scalar Triple D) Dot

55. Just like the collinear forces for free body diagrams there are collinear couple and the net moment is taken out from it. [C]

A) The first part of the statement is false and other part is true B) The first part of the statement is false and other part is false too C) The first part of the statement is true and other part is false D) The first part of the statement is true and other part is true too

56. The simplification of the forces on the free body diagrams is done as _____ [A]

A) A particular system of rule is followed B) No simplification of the forces is possible C) The forces are already simplified and don't need simplification D) The forces are very tentative quantity on terms of simplification and hence no simplification possible

57. The couple is a scalar quantity and the force is vector quantity and hence only force can be simplified in free body diagrams. [A]

A) The first part of the statement is false and other part is true B) The first part of the statement is false and other part is false too C) The first part of the statement is true and other part is false D) The first part of the statement is true and other part is true too

58. The couple is simplified easily by the help of right hand rule in free body diagrams. But the forces simplification is not possible as there is no such system of rules so that the forces can be simplified. [B]

A) The first part of the statement is false and other part is true B) The first part of the statement is false and other part is false too C) The first part of the statement is true and other part is false D) The first part of the statement is true and other part is true too

59. The couple and the other two force systems in free body diagrams can be easily simplified. [B]

A) Statement is wrong B) Statement is right C) Statement is right if we remove 'couple' part D) Statement is right if we remove 'force' part

60. The force and the couple can't be simplified together as one is the cause and the other is the effect in free body diagrams. [C]

A) The statement is correct and the reason given is also correct B) The statement is wrong but the reason given is also correct C) The statement is wrong and the reason given is also wrong D) The statement is correct but the reason given is also wrong

61. What is a collinear system of forces for free body diagrams? [C]

A) The force system having all the forces parallel to each other
B) The force system having all the forces perpendicular to each other
C) The force system having all the forces emerging from a single point
D) Forces cannot form a collinear system of forces, it is not possible

62. The main motion of the free body diagrams is to: [A]

A) To reduce the calculation
B) To add the forces with the couples and take out the total
C) To subtract the forces with the couples and take out the total
D) To multiply the forces with the couples and take out the total

63. The simplification of the couple is done for free body diagrams on the basis of the: [A]

A) The clockwise of the anti-clockwise rotation sign convention
B) The simplification is not possible
C) The couple is a vector and thus can't be simplified
D) The couple is a scalar and can't be simplified

64. Principle of transmissibility for free body diagrams is: [A]

A) It states that the force acting on the body is a sliding vector
B) It states that the force acting on the body is a rolling vector
C) It states that the force acting on the body is a wedging vector
D) It states that the force acting on the body is a unit vector

65. A body is consisted of _____ number of particles. [A]

A) Infinite
B) Finite
C) Hundreds
D) Thousands

66. The all small weights that are being applied by all the infinite particles of the body act _____ to each other. [B]

A) Parallel
B) Perpendicular
C) Collinear
D) Divergent

67. The total of all the weights of small particles adds up to give the total body weight. This weight is the force vector which is being passed by _____ [C]

A) Axis of rotation
B) Axis of rolling
C) Centre of Gravity
D) Centre of mass

68. Volume is best given by _____ [B]

A) Product of mass and density
B) Ratio of mass to density
C) Addition of mass and density
D) Subtraction of mass and density

69. Which of the following is a vector quantity [C]

A) Energy
B) mass
C) momentum
D) speed.

70. Frictional force encountered after commencement of motion is called [C]

A) limiting friction B) kinematic friction C) frictional resistance D) Dynamic friction.

71. Mass is best given by _____ [B]

A) Product of volume and density B) Ratio of mass to density C) Addition of mass and density D) Subtraction of mass and density

72. We use sometimes the measures to know the direction of moment in the calculations of the centre of mass. It is done by right handed coordinate system. Which is right about it(consider the mentioned axis to be positive)? [A]

A) Thumb is z-axis, fingers curled from x-axis to y-axis B) Thumb is x-axis, fingers curled from z-axis to y-axis C) Thumb is y-axis, fingers curled from x-axis to z-axis D) Thumb is z-axis, fingers curled from y-axis to x-axis

73. The all small masses that are being applied by all the infinite particles of the body act _____ to each other. [A]

A) Parallel B) Perpendicular C) Collinear D) Divergent

74. What is not the condition for the equilibrium in calculations involved in the determination of the centre of mass? [D]

A) $\sum Fx=0$ B) $\sum Fy=0$ C) $\sum Fz=0$ D) $\sum F \neq 0$

75. We first make equilibrium equations of the body by considering all the three dimensional forces and then the free body diagram is made and then equations are made to be applied so as to calculate the centre of mass. [D]

A) The first part of the statement is false and other part is true B) The first part of the statement is false and other part is false too C) The first part of the statement is true and other part is false D) The first part of the statement is true and other part is true too

76. One of the use of the centre of mass or centroid is as in the simplification of the loading system the net force acts at the _____ of the loading body. [A]

A) Centroid B) The centre axis C) The corner D) The base

77. The body is sometimes acted by two or three force members. The difference between the two and the three force members is _____ [D]

A) The former is collinear and the latter is parallel B) The former is parallel and the latter is perpendicular C) The former is perpendicular and the latter is collinear D) The former is acting on two points in the body while the latter is on three points

78. If the force vector F acting along the centroid is having its x-axis component being equal to Z N, y-axis component be X N and z-axis component be Y N then vector F is best represented by? [D]

A) Xi + Yj + Zk B) Yi + Xj + Zk C) Zi + Yj + Xk D) Zi + Xj + Yk

79. Centroid of a body does depends upon the small weights of tiny particles. Which statement is right for force acting by the small particles of the body having it's vector form as = Ai + Bj + Ck? [C]

A) In rectangular components representation of any vector we have vector F = Ai + Bj + Ck
B) In rectangular components representation of any vector we have vector F = Ax + By + Cz
C) In rectangular components representation of any vector we have vector F = Fx + Fy + Fz
D) In rectangular components representation of any vector we have vector F = Fi + Fj + Fk

80. Centroid determination involves the calculations of various forces. In that forces are having various properties. That is force is developed by a support that not allows the _____ of its attached member. [B]

A) Translation
B) Rotation
C) Addition
D) Subtraction

81. From a circular plate of diameter 6 cm is cut out a circle whose diameter is a radius of the plate. Find the e.g. of the remainder from the center of circular plate [A]

A) 0.5 cm
B) 1.0 cm
C) 2.5 cm
D) 0.25 cm.

82. A _____ body consists of a series of connected "simpler" shaped bodies. [A]

A) Composite
B) Non-composite
C) Digital
D) Binary

83. Composite materials can be of _____ shapes. [A]

A) Any
B) Circular only
C) Rectangular only
D) Oval only

84. Two of the things of the composite materials are to be known so that their properties can be varied. Which of the following is one of them? [C]

A) Weight of the centre of gravity
B) Weight of the centre of body
C) Location of the centre of gravity
D) Location of the centre of mass

85. The centre of mass for the composite body is the ratio of _____ to _____ [D]

A) The product of centroid and mass to the total weight
B) The addition of centroid and weight to the total weight
C) The subtraction of centroid and weight to the total weight
D) The product of centroid and mass to the total mass

86. The total of all the masses of small particles adds up to give the total body mass of the composite body. This mass lies along with gravity gives a force vector which is being passed by _____ [C]

A) Axis of rotation
B) Axis of rolling
C) Centre of Gravity
D) Centre of mass

87. If any external force also is applied on the distributed loading on the composite body then? [D]

A) The net force will act at the centroid of the structure only
B) The net load will not be formed as all the forces will be cancelled
C) The net force will act on the base of the loading horizontally
D) The net force will not to be considered, there would be a net force of the distribution, and rest will be the external forces

88. A composite body is consisted of _____ number of particles. [A]

A) Infinite B) Finite C) Hundreds D) Thousands

89. When there is no relative force between touching surfaces, which of the following force is developed? [D]

A) Dry friction B) Dynamic friction C) Fluid friction D) Static friction

90. Product of the area, _____ and the perpendicular distance from axis are being used in the theorem to find the area of the revolution. [A]

A) Length of generated curve B) Length of generated radius C) Length of generated length vector D) Length of generated area vector

91. The distance used in the theorem is the distance travelled by _____ [B]

A) Body B) Body's centroid C) Body's length vector D) Body's radius vector

92. Product of the Volume, _____ and the perpendicular distance from axis are being used in the theorem to find the volume of the revolution. [A]

A) Area of generated curve B) Area of generated radius C) Area of generated length vector D) Area of generated area vector

93. The system of the collinear and the parallel force for the bodies over which this theorem is to be applied are simplified as: [A]

A) The simplified collinear force system gives us a net force and the parallel force system gives us a simplified force, and then we add it vectorially
B) Such simplification is not possible
C) The simplification is usually done by not considering the directions of the both
D) The simplification is done by considering the rotations only

94. Whenever the distributed loading acts perpendicular to an area its intensity varies _____ [A]

A) Linearly B) Non-Linearly C) Parabolically D) Cubically

95. the ratio of limiting friction to the normal reaction [C]

A) limiting friction B) cone friction C) coefficient of friction D) dry friction

96. This reaction, which is taken to act---------- to the plane,is called normal reaction [D]

A) equal B) inclined C) parallel D) perpendicular

97. It has been experienced that whenever a body, lying on a horizontal or an inclined surface, is in equilibrium, its weight acts---------- through its centre of gravity. [B]

A) towards left B) vertically downwards C) vertically upwards D) towards right

98. The ---------- of a body of revolution is equal to the length of the generating area times the distance traveled by the centroid of the area while the body is being generated [B]

A) surface Area B) volume C) circumference D) non of the mentioned

99. The --------- of a surface of revolution is equal to the length of the generating curve times the distance traveled by the centroid of the curve while the surface is being generated [A]

A) surface Area B) volume C) circumference D) non of the mentioned

100. an imaginary cone formed by revolving the resultant (r) of the normal reaction (n) and limiting friction al force (f) about the normal reaction (n) for one complete revolution is called [B]

A) limiting friction B) cone friction C) coefficient of friction D) dry friction