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Time : 3 Hr. **JEE MAINS TEST SERIES** **Time:** **Marks:**

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1. Let f : R $\to$ R be a function satisfies that
   $3f(2x^2 - 3x + 5) + 2f(3x^2 - 2x + 4) = x^2 - 7x + 9 \ \forall \ x \in R$ then the value of f(5) is
   1) 21/5 2) 0 3) 9/5 4) 3
2. If f R $\to$ R is a function satisfies $f(x + 1) + f(x + 3) = 2 \ \forall \ x \in R$, then the period of f(x) is
   1) 3 2) 5 3) 2 4) 4
3. The number of ordered pairs (a, b) from the set A = {1,2,3,4,5} so that the function $f(x) = \frac{x^3}{3} + \frac{ax^2}{2} + bx + 10$ is an injective mapping $\forall \ x \in R$ is
   1) 14 2) 16 3) 15 4) 13
4. Let f be a function defined on (–1, 1) as $f(x) = \begin{cases} \frac{2^{\sin^{-1}x} - 2^{\tan^{-1}x}}{2^{\tan x} - 2^{\sin x}}, & x \neq 0 \end{cases}$ and f(0) = K, then the value of K such that f(x) is continuous at x = 0 is
   1) 0 2) 1 3) 1/2 4) log2
5. Let f : R $\to$ R be a function defined by $f(x) = \begin{cases} 5x, & if \ x \in Q \\ x^2 + 6, & if \ x \in R - Q \end{cases}$, Q is set of rational numbers then f(x)3
   1) Continuous $\forall \ x \in R$ 2) Discontinuous $\forall \ x \in R$
   3) Continuous at x = 0 only 4) Continuous at x = 2, 3 only
6. If y is a function of x and log(x + y) = 2xy, then the value of $y'(0)$ is, where y' is derivative of y w.r.t x
   1) 0 2) –1 3) 1 4) 2
7. If $\sqrt{x+y} + \sqrt{y-x} = c,$ then the value of $\frac{dy}{dx}$ is
   1) $\frac{2x}{c^2}$ 2) $\frac{2}{c^2}$ 3) 2x 4) $\frac{-4x}{c^2}$
8. Suppose f(x) is a differentiable which satisfy $f(x + y) = f(x) + f(y) + x^2.y^2$ and $\lim_{x \to 0} \frac{f(x)}{x} = 100,$ then the value of $f'(0)$ is
   1) 0 2) 1 3) 2 4) 100
9. The value of $\lim_{\theta \to 0} \frac{\sin^3\theta - \tan^3\theta}{\theta^5}$ is
   1) 3/2 2) –2/3 3) 1/3 4) –3/2
10. If $\lim_{x \to \infty} \left(a^x + e^x\right)^{\frac{1}{x}} = a, (a > 0)$ when a $\in$
    1) (1, ∞) 2) (e, ∞) 3) (1, e) 4) No such 'a' exist

11. $\lim_{x\to 0}\left(\sin^2\left(\frac{\pi}{2-ax}\right)\right)^{\sec^2\frac{\pi}{2-bx}} =$

1) e^{a^2/b^2} 2) 1 3) e 4) Doesn't exist

12. The equation of the normal to the curve defined parametrically $x = t^2 + 3t - 8$, $y = 2t^2 - 2t - 5$ at P(2, –1) is

1) $7x + 6y - 8 = 0$ 2) $7x - 6y\ 20 = 0$ 3) $2x - 3y - 7 = 0$ 4) $7x - 6y - 8 = 0$

13. If the curve $f(x) = (x - 2)^{2/3}(2x + 1)$ intersects x-axis at A and B and has a horizontal tangent at 'C', then the area of triangle ABC is

1) 5/2 2) 10/3 3) 15/2 4) 15/4

14. The number of positive roots of $f(x) = x + \cos x - a$ is (where $a < 1$)

1) 1 2) 2 3) 4 4) 0

15. If $f(x) = x^3 + 2x^2 + x + 5$ has only real root α then the value of $[\alpha]$ is, where [.] is G.I.F

1) –1 2) –2 3) –3 4) –4

16. The radius of a right circular cylinder increases at the rate of 0.1 cm/min and the height decreased at the rate 0.2 cm/min. when radius is 2cm and height is 3cm, the rate of change of volume is

1) -2π 2) $-8\pi/5$ 3) $-3\pi/5$ 4) $2\pi/5$

17. A kite is at 15 mts height and 20mts string are out. The kite starts drifting away horizontally at the speed of 4Kmph. Then how much fast is string being released

1) 4 2) $\sqrt{7}$ 3) 2 4) $\sqrt{5}$

18. If $2x^3 - 9x^2 + 12x + a = 0$ has 3 real and distinct roots then $a \in$

1) (–1, 2) 2) (0, 3) 3) (1, 4) 4) (–5, 4)

19. The function $f(x) = \frac{x}{\log_e^x}$ is decreasing in

1) (e, ∞) 2) (0, 1) ∪ (1, e) 3) (0, e) 4) (1, ∞)

20. The maximum value of $f(x) = x^2 . e^{-2x}$, $x > 0$ is

1) e^{-2} 2) $\frac{1}{2e}$ 3) $\frac{1}{e}$ 4) $\frac{1}{e^3}$

21. The value of $\lim_{x\to\infty}\frac{\log_e(\log_e x)}{e^{\sqrt{x}}}$ is

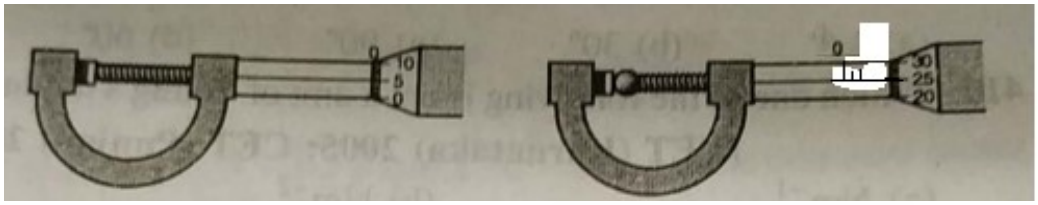
22. If the equation $x^3 + x^2 - 4 = 0$ has a solution in the minimum interval (a, b) where a, $b \in z$, then the value of a + b is

23. If $y = \frac{x^4 + x^2 + 1}{x^2 + x + 1}$ such that $\frac{dy}{dx} = ax + b$ then the value of $a^2 + b^2$ is

24. If $f(x) = 5x^3 - 15x^2 - 120x + 3$ is increasing in $(-\infty, a) \cup (b, \infty)$ and decreasing in (a, b) then the value of b –a is

25. The number of critical points of $f(x)=\begin{cases} x^{3/5}, & if\ x<1 \\ 2-x^2, & if\ x\geq 1 \end{cases}$ is

26. The number of divisions on circular scale of shown screw gauge are 50. It moves 0.5mm on main scale in one rotation. The diameter of the ball is



1) 2.25mm 2) 2.20 mm 3) 1.20 mm 4) 1.25 mm

27. With what minimum speed of particle be projected from origin so that it is able to pass through a given point (30m, 40m):

1) 60 m/s 2) 30 m/s 3) 50 m/s 4) 40 m/s

28. The sides of a triangle representing the three force vectors are in the ratio 20 :17 : 10. The angles of the triangle will be

1) $75^0, 60^0, 45^0$ 2) $80^0, 55^0, 45^0$ 3) $90^0, 60^0, 30^0$ 4) $90^0, 51^0, 39^0$

29. The velocity of water waves may depend on their wavelength λ, the density of water ρ and the acceleration due to gravity g. The method of dimensions gives the relation between these quantities as

1) $\upsilon^2 \propto \lambda g^{-1} \rho^{-1}$ 2) $\upsilon^2 \propto g\lambda$ 3) $\upsilon^2 \propto \lambda g\rho$ 4) $\upsilon^2 \propto g^{-1}\lambda^2$

30. Which of the following is the most accurate instrument for measuring length

1) Vernier calipers having 20 divisions on the sliding scale which coincide with 19 divisions on the main millimeter scale

2) A screw gauge having pitch 1 mm and 50 divisions on the circular scale

3) A vernier scale of least count 0.1mm

4) A screw gauge of least count 0.01mm

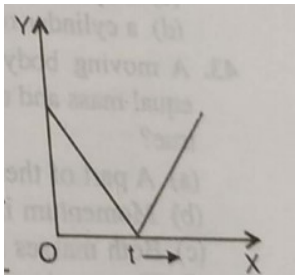
31. While measuring the acceleration due to gravity by the simple pendulum, a student makes a positive error of 1% in the length of the pendulum and negative error of 3% in the value of time period. His percentage error on the measurement of g by relation $g=4\pi^2(l/T^2)$ will be

1) 2% 2) 4% 3) 7% 4) 10%

32. A shower of rain appears to fall vertically downwards with a velocity of 12 kmph on a person walking west wards with a velocity of 5 kmph. The actual velocity and direction of the rain are

1) 7.5 kmph, clockwise to vertical
2) 13 kmph, anticlockwise to vertical
3) 13 kmph, clockwise to vertical
4) 17 kmph, clockwise to vertical

33. In the graph shown in the following figure x–axis represents time. The y–axis could represent

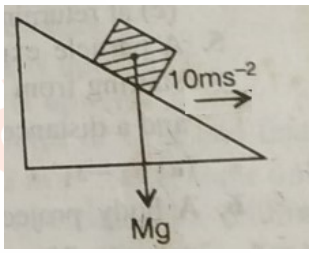


1) Speed of a body projected under gravity
2) Velocity of a body projected under gravity
3) Acceleration of a body projected under gravity
4) Distance travelled by a body projected under gravity

34. Person aiming to reach the exactly opposite point on the bank of a stream is swimming with a speed of 0.5 ms^{-1} at an angle of 120^0 with the direction of flow of water. The speed of water in the stream is

1) 1 ms^{-1} 2) 0.25 ms^{-1} 3) 0.67 ms^{-1} 4) 3 ms^{-1}

35. A block of mass M is placed on an inclined plane of inclination 45^0 with horizontal . The inclined plane moves horizontally with an acc. Of 10 ms^{-2} as shown in the figure. If acc. Due to gravity is 10 ms^{-2} the block will



1) Move upwards along the plane 2) Move downwards along the plane
3) Be thrown away from the plane 4) Be at rest on the plane

36. The relation between the time t and distance x is given by $t=px^2+qx$. Where p and q are constants. The relation between velocity υ and acceleration a will be

1) $a \propto \upsilon^3$ 2) $a \propto \upsilon^2$ 3) $a \propto \upsilon^4$ 4) $a \propto \upsilon$

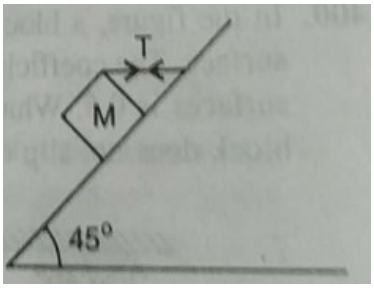
37. A car travelling on a level road cannot have an acceleration greater in magnitude than (μ is coefficient of friction)

1) μg 2) $\mu^2 g$ 3) G 4) g/μ

38. Two particles are projected from the ground from same point simultaneously with speeds 20 m/s and $20/\sqrt{3}$ m/s at angles 30^0 and 60^0 with the horizontal in the same direction. The maximum distance between them till both of them, strike the ground is approximately : ($g=10\ m/s^2$)

1) 23.1 m 2) 16.4 m 3) 30.2 m 4) 10.4 m

39. A block of mass 15 kg is resting on a rough inclined plane as shown in the figure. The block is tied up by a horizontal string which has a tension of 50N. The coefficient of friction between the surfaces of contact is ($g=10\ m/s^2$)



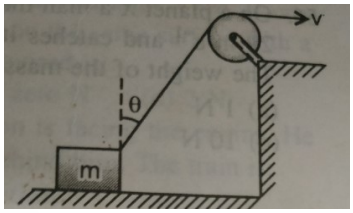
1) 1/2 2) 2/3 3) 3/4 4) 1/4

40. Water falls from a tap at a height H above the floor of a cylindrical vessel of area of cross section S at a constant rate V m^3/sec. If the density of water is ρ. The force F acting on the bottom of cylindrical vessel after a time t sec when the tap is operated will be (h is height of water in vessel after time t)

1) $vt\rho g + V\rho\sqrt{[2g(H-h)]}$ 2) $Vt\rho g$

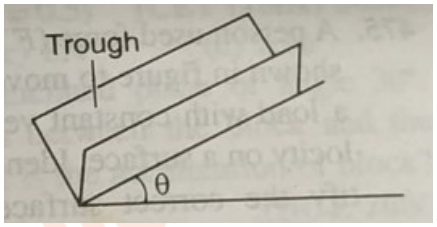
3) $V\rho t\sqrt{[2g(H-VS)]}$ 4) $V\rho gt\sqrt{(2gH)}$

41. A block is dragged on a smooth plane with the help of a rope which moves with a velocity υ as shown in figure. The horizontal velocity of the block is



1) υ 2) $\frac{\upsilon}{\sin\theta}$ 3) $\upsilon\sin\theta$ 4) $\frac{\upsilon}{\cos\theta}$

42. A block of mass m slides in an inclined right angled trough as shown in the figure if the coefficients of kinetic friction between block and material composing the trough is μ_k. Find the acceleration of the block

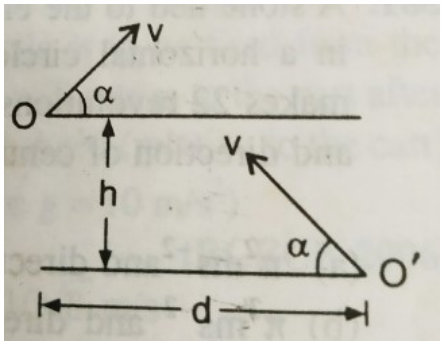


1) $g(\sin\theta - \sqrt{2}\mu_k\cos\theta)$ 2) $g(\sin\theta - \mu_k\cos\theta)$ 3) $g(\sin\theta - 2\mu_k\cos\theta)$ 4) $g\left(\sin\theta - \sqrt{\mu_K}\cos\theta\right)$

43. A particle is projected with a certain velocity at an angle α above the horizontal from the foot of an inclined plane of inclination 30^0. IF the particle strikes the plane normally the α is equal to

1) $30 + \tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$ 2) 45^0 3) 60^0 4) $30^0 + \tan^{-1}\left(2\sqrt{3}\right)$

44. Two particles are projected simultaneously from two points O and O` such that d is the horizontal distance and h is the vertical distance between them as shown in the figure. They are projected at the same inclination α to the horizontal with the same velocity υ. The time after which their separation becomes minimum is



1) $\frac{d}{\upsilon\cos\alpha}$ 2) $\frac{2d}{\upsilon\cos\alpha}$ 3) $\frac{d}{2\upsilon\cos\alpha}$ 4) $\frac{d}{\upsilon}$

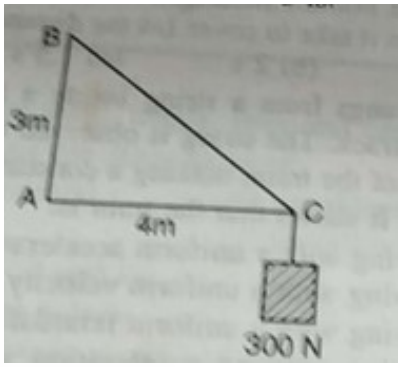
45. Two cars A and B are travelling in the same direction with velocities V_A and V_B ($V_A > V_B$). When the car A is at a distance s behind the car B, the driver of the car A applies the brakes producing a uniform retardation a; there will be no collision when

1) $s < \frac{(V_A - V_B)^2}{}$ 2) $s = \frac{(V_A - V_B)^2}{2a}$ 3) $s \geq \frac{(V_A - V_B)^2}{2a}$ 4) $s \leq \frac{(V_A - V_B)^2}{2a}$

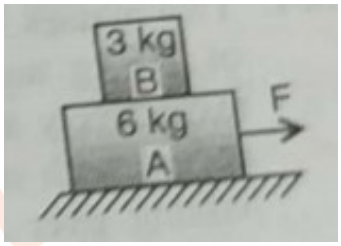
46. If the velocity of projection of a body is increased by 1percent, other things remaining constant, the horizontal range will increase by x% then find x

47. A body of mass 1 kg crosses a point O with a velocity 60 ms^{-1}. A force of 10N directed towards O begins to act on it. It will again cross O in time t seconds then find t

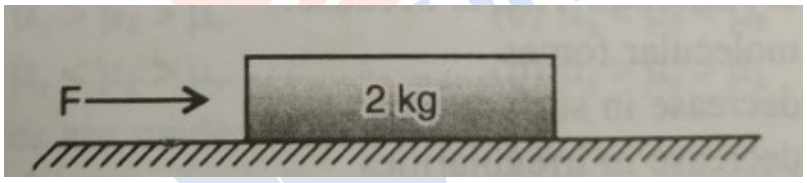
48. In the adjoining figure, AB, BC and AC are light metallic rods hinged at B. The tension on the rod BC is in newtons will be



49. Two blocks A and B of masses 6 kg and 3 kg rest on a smooth horizontal surface as shown in the figure. If coefficient of friction between A and B is 0.4, the maximum horizontal force which can make them without separation will be x newtons then find x



50. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. A force of 2.8 N is applied on the block as shown in figure. The force of friction between the block and the floor is (Take g= 10 ms^{-2})



51. The angular momentum of an electron in a Bohr's orbit of He^+ is 3.1652×10^{-34} Kg-m^2sec. What is the wave number in terms of Rydberg constant (R) of the spectral line emitted when an electron falls from this level to the first excited state.

[use h = 6.626×10^{-34} J.s]

1) 3R 2) 5R/9 3) 3R/4 4) 8R/9

52.

	Column – I		Column – II
A)	Solvey process	P)	NaCl
B)	Evolve $CO_2 \uparrow$ on heating	Q)	Na_2O_2
C)	Aq. Soln. is neutral towards litmus	R)	$NaHCO_3$
D)	Oxone	S)	Na_2CO_3

1) A-S, B-R, C-P, D-Q
2) A-S, B-R, C-Q, D-P
3) A-Q, B-R, C-P, D-Q
4) A-R, B-Q, C-P, D-S

53. If water samples are taken from sea, rivers or lake, they will be found to contain hydrogen and oxygen in the approximate ratio of 1 : 8. This indicates the law of
1) Multiple proportion 2) Definite proportion
3) Reciprocal proportions 4) All of these

54. Which of the following is a metallic hydride?
1) LaH_{25} 2) CaH_2 3) SnH_4 4) $LiBH_1$

55. An electron in an atom jumps in such a way that its kinetic energy changes from x to x/4. The change in potential energy will be
1) $+\frac{3}{2}x$ 2) $-\frac{3}{8}x$ 3) $+\frac{3}{4}x$ 4) $-\frac{3}{4}x$

56. The Li^+ ion, though smallest in size is the poorest conductor of electricity as compared to other alkali metal ions in aqueous solution. This is due to
1) Its smaller ionic radius 2) Its low electropositive character
3) Its larger degree of hydration 4) Its high melting and boiling points

57. Beryllium chloride can be prepared by passing chlorine vapours over heated mixture of
1) BeO and CO_2 2) $BeCO_3$ and C 3) Beo and C 4) $Be(OH)_2$ and C

58. 1 mole of $Ba(OH)_2$ will exactly neutralize
1) 2 mole H_3PO_2 2) 1 mole of H_2SO_4 3) 1 mole of H_3PO_3 4) All

59. Photochemical oxidants such as PAN is formed
A) By the action of nitrogen oxides on hydrocarbons in the presence of sunlight
B) By the action of carbondioxide on hydrocarbons in the presence of sunlight
C) By the action of hydrogen sulphide on hydrocarbons in the presence of sunlight
1) A 2) B 3) B & C 4) A & C

60. The metal liberated into the environment through exhaust fumes of motor vehicles is
1) Hg 2) As 3) Pb 4) NO_2

61. The irritant red haze in the traffic and congested places is due to
1) Oxides of S 2) Oxides of N 3) Oxides of C 4) Oxides of P

62. The strength of 20 volume of H_2O_2 is
1) 13.6 g/litre 2) 60 g/litre 3) 160 g/litre 4) 20 g/litre

63. The gas which is causes yellowing of Tajmahal
1) H_2S 2) SO_2 3) CO_2 4) NO_2

64. In Calgon process of softening hard water, the Ca^{2+} and Mg^{2+} ions present in hard water are rendered ineffective by
1) Sodium silicates 2) Sodium poilymetaphosphate
3) Mixture of silica and ammonia 4) Aquaregia

65. If a_0 be the radius of first Bohr's orbit H-atom, the de-Broglie's wavelength of an electron revolving in the second Bohr's orbit will be
1) $6\pi a_0$ 2) $4\pi a_0$ 3) $2\pi a_0$ 4) πa_0

66. 44 g of a sample on complete combustion gives 88 gm CO_2 and 36 gm of H_2O. the molecular formula of the compound may be
    1) C_4H_6 2) C_2H_5O 3) C_2H_4O 4) C_3H_5O
67. The pair of chemicals that maintain heat balance in troposphere are
    1) N_2, O_2 2) H_2O, NO^+ 3) CO_2, O_2^+ 4) O_3, O^+
68. The formula of exhausted permutit is
    1) $CaAl_2Si_2O_8.\ xH_2O$ 2) $Na_2Al_2Si_2O_8.\ xH_2O$
    3) $CaB_2Si_2O_8.xH_2O$ 4) $K_2Al_2Si_2O_8.xH_2O$
69. Gases responsible for acid rain are
    1) NO, CO_2 2) NO_2, SO_2 3) CO, CO_2 4) CO, SO_2
70. The total spin resulting from a d^7 configuration is
    1) 3/2 2) 1/2 3) 2 4) 1
71. The COD value of a water samples is 40 ppm. Calculate the amount of $K_2Cr_2O_7$ (M.W=294)required to oxidize the organic matter present in 500 ml of that water sample
72. If the number of values of m is seven, the value of azimuthal quantum number should be
73. 0.2 mole of HCl and 0.2 mole of barium chloride were dissolved in water to produce a 500 mL solution. The molarity of the Cl^- ions is
74. If the value of (n + l) is more than 3 and less than 6, what will be the possible number of orbitals
75. When 10ml of 5M H_2O_2 aqueous solution is decomposed at STP. Volume of oxygen obtained is

THE END