AIEEE MODEL EXAM

Time: 3hours ***Maximum marks: 315***

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

INSTRUCTIONS

A. General:

1. There are three sections in this paper consisting of Mathematic, Chemistry and Physics.
2. For each correct answer 3 marks will be awarded and for each incorrect answer, 1 mark will be deducted.
3. Mark only one correct answer out of four alternatives.
4. Use Blue/Bank ball point pen only for writing particulars/or any marking.
5. Use of calculator is not allowed.
6. Darken the circles in the space provided only.
7. Use of white fluid or any other material which damages the answer sheet, is not permitted.

1. Range of the function $f(x)=\frac{x^2+x+2}{x^2+x+1}, x\in R$ is

(A) $(1, \infty)$ (B) $\left(1, \frac{3}{2}\right)$

(C) $\left(1, \frac{7}{3}\right]$ (D) $\left(1, \frac{7}{5}\right]$

2. Domain of f(x) satisfying $2^x + 2^{f(x)} = 2$ is

(A) (– 1, 1) (B) (– □, – 1)

(C) (– □, 1) (D) none of these

3. If f(x) = 3x, $g(x)=\frac{x}{3}$, h(x) = f(g(x)) then h(h(..... n times)) equal to

(A) x^n (B) x

(C) $3^n x$ (D) none of these

4. The value of f(x) = 3 sinx – 4 cosx + 5 lies between the interval is

(A) [0, 10] (B) (0, 10)

(C) [–5, 10] (D) none of these

5. The period of the function f(x) = sin2x + tan (x/2) is

(A) 4π (B) 2π

(C) π (D) π/2

6. Total number of solution of ||x| – 5| = 2, is/are

(A) 0 (B) 1

(C) 2 (D) 4

7. $\lim_{x\to 0}(1+\sin x)^{\cot x}$ is equal to

(A) e (B) $\frac{1}{e}$

(C) e^2 (D) 1

8. $\lim_{x\to\infty}\frac{\sqrt{x^2+1}-\sqrt[3]{x^2-1}}{\sqrt[4]{x^4+1}-\sqrt[5]{x^4+1}}$ is equal to

(A) 0 (B) 1

(C) – 1 (D) none of these

9. Let α and β be the distinct roots of $ax^2 + bx + c = 0$, then $\lim_{x\to\alpha}\frac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}$ is equal to

(A) $\frac{1}{2}(\alpha-\beta)^2$ (B) $-\frac{a^2}{2}(\alpha-\beta)^2$

(C) 0 (D) $\frac{a^2}{2}(\alpha-\beta)^2$

10. Function f(x) = |sin x| + |cos x| + |x| is discontinuous at

(A) x = 0 (B) $x=\frac{\pi}{2}$

(C) $x = \pi$ (D) no where

11. Find the value of the constant k, so that $f(x)=\begin{cases}\frac{1-\cos 2x}{2x^2}, & x\neq 0\\ k, & x=0\end{cases}$ is continuous at x = 0

(A) 1 (B) – 1

(C) 0 (D) none of these

12. If $f(x)=\frac{1-\tan x}{4x-\pi}, x\neq\frac{\pi}{4}, x\in\left[0,\frac{\pi}{2}\right]$ is a continuous function, then $f\left(\frac{\pi}{4}\right)$ is equal to

(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$

(C) 1 (D) – 1

13. If $f(x)=\frac{1-\sin x+\cos x}{1+\sin x+\cos x}$, is continuous at x = π, then f(π) is equal to

(A) – 1 (B) 2

(C) $\frac{1}{4}$ (D) π

14. If $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, find $\frac{dy}{dx}$

(A) $\frac{-b^2}{a^2}\frac{x}{y}$ (B) $\frac{b^2}{a^2}\frac{x}{y}$

(C) $\frac{b^2}{a^2}\frac{y}{x}$ (D) none of these

15. If $y=\cos^{-1}\left(\frac{2\cos x+3\sin x}{\sqrt{13}}\right)$, find $\frac{dy}{dx}$

(A) 1 (B) 0

(C) $\frac{1}{2}$ (D) none of these

16. If $y=\log\left[x+\sqrt{x^2+a^2}\right]$, find $\frac{dy}{dx}$

(A) $\frac{1}{\sqrt{x^2+a^2}}$ (B) $\frac{1}{\sqrt{x^2-a^2}}$

(C) $\frac{1}{\sqrt{a^2-x^2}}$ (D) none of these

17. The slope of the tangent to the circle $x^2 + y^2 = 2c^2$ at point (c, c) is

(A) 1 (B) – 1

(C) 0 (D) 2

18. The sum of the squares of intercepts on axes made by a tangent at any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$ is

(A) a (B) 2a

(C) a^2 (D) $2a^2$

19. For all real values of x, increasing function is

(A) x^{-1} (B) x^2

(C) x^3 (D) x^4

20. Function $f(x) = x^3 - 27x + 5$ is monotonic increasing when

(A) $x < -3$ (B) $|x| > 3$

(C) $x \leq -3$ (D) $|x| \geq 3$

21. The set of values of a for which the function $f(x) = x^2 + ax + 1$ is an increasing function on [1, 2] is

(A) $(-2, \infty)$ (B) $[-4, \infty)$

(C) $[-\infty, -2)$ (D) $(-\infty, 2]$

22. If $x > 0$, $xy = 1$, then minimum value of $x + y$ is

(A) 2 (B) – 2

(C) 1 (D) – 1

23. If $A > 0$, $B > 0$ and $A + B = \pi/3$, then maximum value of tan A. tan B is .....

(A) $-\frac{1}{3}$ (B) $\frac{2}{3}$

(C) $\frac{1}{3}$ (D) $-\frac{2}{3}$

24. If the sum of the squares of the intercepts on the axes cut off by the tangent to the curve $x^{\frac{1}{3}} + y^{\frac{1}{3}} = a^{\frac{1}{3}} (a > 0)$ at $\left(\frac{a}{8}, \frac{a}{8}\right)$ is 2 then a has the value

(A) 1 (B) 2

(C) 4 (D) 8

25. Let $f(x) = (1 + b^2)x^2 + 2bx + 1$ and m(b) is the minimum value of f(x) for a given b
As b varies, the range of m(b) is

(A) [0, 1] (B) $\left(0, \frac{1}{2}\right]$

(C) $\left[\frac{1}{2}, 1\right]$ (D) (0, 1]

26. Number of points of maxima, minima and non differentiability of $f(x) = |x^2 - 4|x||$ respectively, is

(A) 2, 3, 2 (B) 3, 3, 2

(C) 2, 3, 3 (D) 3, 2, 3

27. The equation of the horizontal tangent to the graph of the function $y = e^x + e^{-x}$ is

(A) $y = -2$ (B) $y = -1$

(C) $y = 2$ (D) $y = 1$

28. The length of the subtangent to the ellipse $x = a \cos t$, $y = b \sin t$ at $t = \pi/4$ is

(A) a (B) b

(C) $\frac{b}{\sqrt{2}}$ (D) $\frac{a}{\sqrt{2}}$

29. If the function $f(x) = x^2 + \alpha/x$ has a local minimum at $x = 2$, then the value of α is

(A) 8 (B) 18

(C) 16 (D) 12

30. A curve passes through the point (2, 0) and the slope of the tangent at any point (x, y) is $x^2 - 2x$ for all value of x. The point of maximum ordinate on the curve is

(A) (0, 4/3) (B) (0, 2/3)

(C) (1, 2/3) (D) (2, 4/3)

31. The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable is

(A) $(-\infty, -1) \cup (-1, \infty)$ (B) $(-\infty, \infty)$

(C) $(0, \infty)$ (D) $(-\infty, 0) \cup (0, \infty)$

32. If f is a real-valued differentiable function satisfying $|f(x) - f(y)| \le (x - y)^2$, $x, y \in R$ and $f(0) = 0$ then $f(1)$ equals

(A) 1 (B) 2

(C) 0 (D) –1

33. Let f be differentiable for all x. If $f(1) = -2$ and $f'(x) \geq 2$ for $x \in [1, 6]$, then
(A) $f(6) \geq 8$ (B) $f(6) < 8$
(C) $f(6) < 5$ (D) $f(6) = 5$

34. Let $f : R \to R$ be a function defined by $f(x) = \min \{x + 1, |x| + 1\}$, then which of the following is true?
(A) f(x) is differentiable everywhere (B) f(x) is not differentiable at x = 0
(C) $f(x) \geq 1$ for all $x \in R$ (D) f(x) is not differentiable at x = 1

35. Let $f(x) = \begin{cases} (x-1)\sin\dfrac{1}{x-1} & \text{if } x \neq 1 \\ 0 & \text{if } x = 1 \end{cases}$
Then which one of the following is true?
(A) f is neither differentiable at x = 0 nor at x = 1
(B) f is differentiable at x = 0 and at x = 1
(C) f is differentiable at x = 0 but not at x = 1
(D) f is differentiable at x = 1 but not at x = 0

CHEMISTRY

36. In allene hybridization state of each carbon (as indicated) $\overset{1}{C}H_2 = \overset{2}{C} = \overset{3}{C}H_2$

	1	2	3
(A)	sp^2	sp	sp^2
(B)	sp	sp	sp
(C)	sp^2	sp^2	sp^2
(D)	sp^2	sp^3	sp^2.

37. Which of the following orders regarding electro-negativity of hybrid orbital of carbon is correct
(A) $sp > sp^2 > sp^3$ (B) $sp^2 > sp > sp^3$
(C) $sp^3 > sp^2 > sp$ (D) $sp^2 > sp^3 > sp$.

38. Hydrogen bonding is absent in
(A) H_2O (B) NH_3
(C) C_2H_5OH (D) $C_2H_5OC_2H_5$

39. The geometry and the type of hybrid orbitals present about the central atom in BF_3 is
(A) linear, sp (B) trigonal planar, sp^2
(C) tetrahedral, sp^3 (D) pyramidal, sp^3

40. Which of the following structures is linear ?
(A) SO_2 (B) CO_2
(C) CO_3^{2-} (D) SO_4^{2-}

41. According to Fajan rules, the covalent character is most favoured in
(A) Small cation large anion (B) Small cation, small anion
(C) Large cation, large anion (D) Large cation, small anion.

42. Which of the following has a bond formed by sp-sp^3 overlap ?
(A) $CH_3 - HC = CH - CH_3$ (B) $CH_3 - C \equiv C - H$
(C) $HC \equiv C - H$ (D) $CH_2 = CH - CH = CH_2$

43. NH_3 has higher boiling point than PH_3 because
(A) NH_3 has higher molecular mass
(B) NH_3 undergoes umbrella inversion

(C) NH_3 molecules form H-bonds with one another
(D) NH_3 contains ionic bonds while PH_3 does not

44. The species having highest bond order is
(A) O_2 (B) O_2^-
(C) O_2^+ (D) O_2^{2-}

45. Carbon dioxide is isostructural with which of the following ?
(A) $HgCl_2$ (B) H_2O
(C) $SnCl_2$ (D) NO_2^-

46. Combination of two AO's lead to the formation of
(A) two MO's (B) one MO
(C) three MO's (D) four MO's

47. $AlCl_3$ is covalent while AlF_3 is ionic. This can be justified on the basis of
(A) the valence-bond theory (B) Fajans' rules
(C) none of these (D) hydration energy

48. Orthonitrophenol is steam volatile but paranitrophenol is not because
(A) orthonitrophenol has intramolecular hydrogen bonding while paranitrophenol has intermolecular hydrogen bonding.
(B) both ortho and paranitrophenol have intramolecular hydrogen bonding.
(C) orthonitrophenol has intermolecular hydrogen bonding and paranitrophenol has intramolecular hydrogen bonding.
(D) Van der Waals forces are dominant in orthonitrophenol.

49. How many sigma and pi bonds are present in tetracyanoethylene ?
(A) Nine σ and nine π (B) Five π and nine σ
(C) Nine σ and seven π (D) Eight σ and eight π

50. The bond angle between two hybrid orbitals is 105°. The percentage s-character of hybrid orbital is between
(A) 50 – 55% (B) 9 – 12%
(C) 22 – 23 % (D) 11 – 12%

51. The hydrogen bond is strongest in
(A) O – H …S (B) S – H…O
(C) F – H….F (D) F – H…O

52. The maximum number of H-bonds in which water molecule can participate is
(A) 1 (B) 3
(C) 2 (D) 4

53. The hydrogen line spectrum provides evidence for the
(A) Heisenberg Uncertainty Principle (B) wave like properties of light
(C) Diatomic nature of H_2 (D) quantized nature of atomic energy states.

54. The ratio of energy of the electron in ground state of hydrogen to the electron in first excited state of Be^{+3} is
(A) 4 : 1 (B) 1 : 4
(C) 1 : 8 (D) 8 : 1

55. An electron in a H-like atom is in an excited state. It has a total energy of –3.4 ev, calculate the de-Broglie's wavelength?
(A) 66.5Å (B) 6.66Å
(C) 60.6Å (D) 6.06Å

56. The orbital angular momentum of an electron in 2s orbital is:
(A) $+\frac{1}{2}.\frac{h}{2\pi}$ (B) zero
(C) $\frac{h}{2\pi}$ (D) $\sqrt{2}.\frac{h}{2\pi}$

57. The value of Bohr radius of hydrogen atom is
(A) 0.529×10^{-8} cm (B) 0.529×10^{-10} cm
(C) 0.529×10^{-12}cm (D) 0.529×10^{-6} cm

58. Which of the following represents the correct set of the four quantum numbers of 4d–electrons ?
(A) 4, 3, 2, $+\frac{1}{2}$ (B) 4, 2, 1, 0
(C) 4, 3, -2, $\frac{1}{2}$ (D) 4, 2, 1, $-\frac{1}{2}$

59. Which of the following has maximum number of unpaired electrons ?
(A) Zn (B) Fe^{2+}
(C) Ni^{3+} (D) Cu^{+}

60. The number of moles of $CaCl_2$ needed to react with excess of $AgNO_3$ to produce 4.31 gram of AgCl.
(A) 0.030 (B) 0.015
(C) 0.045 (D) 0.060

61. 1.60g of a metal were dissolved in HNO_3 to prepare its nitrate. The nitrate on strong heating gives 2g oxide. The equivalent weight of metal is
(A) 16 (B) 32
(C) 48 (D) 12

62. A metal oxide has 40% oxygen. The equivalent weight of the metal is
(A) 12 (B) 16
(C) 24 (D) 48

63. 0.2 mol of HCl and 0.1 mol of barium chloride were dissolved in water to produce a 500 mL solution. The molarity of the Cl^- is
(A) 0.06M (B) 0.09M
(C) 0.12M (D) 0.80M

64. Ratio of radii of 2^{nd} and 1^{st} Bohr orbit of H-atom
(A) 2 (B) 4
(C) 3 (D) 5

65. Which bond is most polar
(A) Cl – F (B) Br – F
(C) I – F (D) F – F

66. Calculate the normality of mixture obtained by mixing 100 ml of 0.1 HCl + 50 ml of 0.25 N NaOH
(A) 0.0167 (B) 1
(C) 2 (D) 3

67. The wt. of H_2SO_4 in 1200 ml of a solution of 0.2 N strength is
(A) 10 gm (B) 11.76 gm
(C) 5 gm (D) 1 gm

68. How many milliliter of 0.5 M H_2SO_4 are needed to dissolve 0.5 gm of copper II carbonate (Mol. wt. of $CuCO_3$ = 123.5)
(A) 8.097 ml (B) 1 ml
(C) 7 ml (D) 2 ml

69. The no. of oxalic acid molecules in 100 ml of 0.02 N oxalic is
(A) 6.023×10 (B) 6.023×10^{20}
(C) 6.023×10^{23} (D) none

70. 100 mL of N/5 NaOH will neutralize
(A) 20 ml 1 N HCl (B) 10 ml 1 N HCl
(C) both (D) None of these

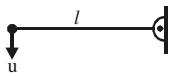
71. A Particle is dropped from the top of a very high tower then the distance covered in the fifth second of its fall is ($g = 10\ m/s^2$)

(A) 25 m (B) 50 m
(C) 45 m (D) 15 m

72. A projectile is fired at an angle of 30° to the horizontal such that the vertical component of its initial velocity is 80 m/s. Its time of flight is T. Its velocity at $t = T/2$ has a magnitude of

(A) 200 m/s (B) 300 m/s
(C) $80\sqrt{3}$ m/s (D) $40\sqrt{2}$ m/s

73. A ball of mass m is attached to one end of a light rod of length l, the other end of which is hinged. What minimum velocity u should be imparted to the ball downwards, so that it can complete the circle.



(A) $\sqrt{gl}$ (B) $\sqrt{5gl}$
(C) $\sqrt{3gl}$ (D) $\sqrt{2gl}$

74. A car is moving with 8 m/s in the east direction, after 5 seconds it was found moving with 6 m/s in the north direction then the magnitude of acceleration acting on the car in this time interval is

(A) 1.5 m/s^2 (B) 0.6 m/s^2
(C) 2 m/s^2 (D) 2.8 m/s^2

75. A uniform rope of length l lies on a table. If the coefficient of friction is μ, then the maximum length l_1 of the part of this rope which can overhang from the edge of the table without sliding down is

(A) $\frac{1}{\mu} l$ (B) $\frac{1}{\mu+1} l$
(C) $\frac{\mu}{\mu+1} l$ (D) $\frac{\mu}{\mu-1} l$

76. A man pushes a wall and fails to displace it. He does

(A) Negative work (B) Positive but not maximum work
(C) No work at all (D) Maximum work

77. A uniform chain has mass M and length L respectively. It is lying on a smooth horizontal table with half of its length hanging vertically down. The work done in pulling the chain up the table is

(A) MgL/2 (B) MgL/4
(C) MgL/8 (D) MgL/16

78. A particle moves under the effect of a force F = cx from x = 0 to $x = x_1$. The work done in the process is

(A) cx_1^2 (B) $\frac{1}{2}cx_1^2$
(C) cx_1^3 (D) zero

79. A force of $\left(3\hat{i}+4\hat{j}\right)N$ acts on a body and displaced it by $\left(3\hat{i}+4\hat{j}\right)m$. The work done by the force is

(A) zero (B) 12 J
(C) 16 J (D) 25 J

80. A person holds a bucket of weight 60 N. He walks 7 m along the horizontal path and then climbs up a vertical distance of 5 m. The work done by the man is

(A) 300 N-m (B) 420 N-m
(C) 720 N-m (D) None of these

81. Under the action of a force, a 2 kg body moves such that its position x as a function of time is given by $x = \frac{t^3}{3}$, where x is in metres and t in seconds. The work done by the force in the first wo seconds is

(A) 1.6 J (B) 16 J
(C) 160 J (D) 1600 J

82. Two trucks, one loaded (A) and the other unloaded (B) are moving and have same kinetic energy. The mass of A is double that of B. Brakes applied to both and are brought to rest. If distance covered by A before coming to rest is s_1 and that by B is s_2, then

(A) $s_1 = s_2$ (B) $s_1 = 2s_2$
(C) $2s_1 = s_2$ (D) $s_1 = 4s_2$

83. A particle of mass M moves in a circle of radius R with a constant speed *v*. The work done when it completes one circle is

(A) $\frac{Mv^2}{R} \times 2\pi R$ (B) $\frac{1}{2} Mv^2$
(C) $\frac{Mv^2}{R} \times \pi R$ (D) zero

84. The work done by external force on a body equals the change in

(A) kinetic energy only (B) potential energy only
(C) thermal energy only (D) total energy

85. If we throw a body upwards with velocity of 4 m/s, at what height does its kinetic energy reduce to half of the initial value ? Take g = 10 ms^{-2}.

(A) 4 m (B) 2 m
(C) 1 m (D) 0.4 m

86. A body moves a distance of 10 m along a straight line under the action of a 5 N force. If the work done is 25 J, then angle between the force and direction of motion of the body is

(A) 30° (B) 45°
(C) 60° (D) 75°

87. A body of mass 15 kg moving with a velocity of 10 ms^{-1} is brought to rest. The work done by the brake is

(A) – 250 J (B) – 500 J
(C) – 750 J (D) – 1000 J

88. Two springs have their force constants as K_1 and K_2 ($K_1 > K_2$). The work done, when both are stretched by the same amount of length, will be

(A) equal (B) greater for K_1
(C) greater for K_2 (D) given data is incomplete

89. Given that the displacement of the body in metre is a function of time as follows:

$$x = 2t^4 + 5$$

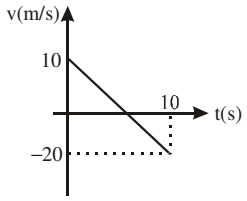
The mass of the body is 2 kg. What is the increase in its kinetic energy one second after the start of motion ?

(A) 8 J (B) 16 J
(C) 32 J (D) 64 J

90. A particle moved from position $\vec{r}_1 = 3\hat{i} + 2\hat{j} - 6\hat{k}$ to position $\vec{r}_2 = 14\hat{i} + 13\hat{j} + 9\hat{k}$ under the action of a force $\left(4\hat{i} + \hat{j} + 3\hat{k}\right)$ Newton. Find the work done

(A) 10 J (B) 100 J
(C) 0.01 J (D) 1 J

91. Velocity-time graph of a particle moving in a straight line is as shown in figure. Mass of the particle is 2 kg. Work done by all the forces acting on the particle in time interval between t = 0 to t = 10 s is

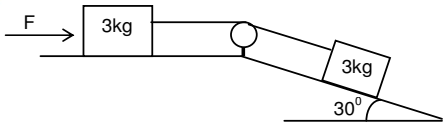


(A) 300 J (B) – 300 J
(C) 400 J (D) – 400 J

92. A long spring is stretched by 2 cm; its potential energy is U. If the spring is stretched by 10 cm, the potential energy stored in it will be
(A) U/25 (B) U/5
(C) 5U (D) 25 U

93. The kinetic energy acquired by a mass m in traveling a certain distance d, starting from rest under the action of a constant force, is directly proportional to
(A) $\sqrt{m}$ (B) independent of m
(C) $\frac{1}{\sqrt{m}}$ (D) m

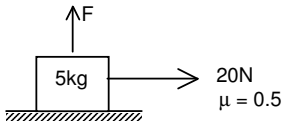
94. In the figure shown if the value of the force F is 2.3 N the tension in the connecting string will be (all surface are smooth). ($g = 10\ m/s^2$)



(A) 1.2 N (B) 4N
(C) 5 N (D) 6.3 N

95. Find the maximum value of F so that the connecting string does not become slack in above question ($g = 10\ m/s^2$)
(A) 10N (B) 6N
(C) 15 (D) 4.6 N

96. The minimum value of the force F so that the block shown in figure start to slide.



(A) 50 N (B) 20 N
(C) 10 N (D) 25N

97. A force 'F' stops a body of mass 'm' moving with a velocity 'u' in a distance 's'. The force required to stop a body of double the mass moving with double the velocity in the same distance is
(A) 2F (B) 4F
(C) 6F (D) 8F

98. The principle of conservation of energy implies that
(A) the total mechanical energy is conserved
(B) the total kinetic energy is conserved
(C) the total potential energy is conserved
(D) sum of all types of energies is conserved

99. A particle is projected with kinetic energy E at 30° to the horizontal. The kinetic energy at the highest point is
(A) $\frac{3E}{4}$ (B) $\frac{E}{2}$
(C) $\frac{\sqrt{3}E}{2}$ (D) $\frac{E}{4}$

100. A particle is released from a height H above the ground level. At a certain height its kinetic energy is two times its potential energy as measured w.r.t. the ground level. Height and speed of particle at that instant are

(A) $\frac{H}{3}\cdot\sqrt{\frac{3gH}{3}}$ (B) $\frac{H}{3}\cdot 2\sqrt{\frac{gH}{3}}$

(C) $\frac{2H}{3}\cdot\sqrt{\frac{2gH}{3}}$ (D) $\frac{H}{3}\cdot\sqrt{2gH}$

101. A 5 kg block is kept on a horizontal plank at rest. At time t = 0, the plank starts moving with a constant acceleration of 1 m/s^2. The coefficient of friction between the block and the plank is 0.2. The work done by the force of friction on the block in the fixed reference frame in 10s is

(A) + 250 J (B) –250 J

(C) + 500 J (D) – 500 J

102. A particle of mass m starts from rest and moves in a circular path of radius R with a uniform angular acceleration α rad/s^2. The kinetic energy of the particle after n revolutions is

(A) $n\alpha mR^2$ (B) $2\pi n\alpha mR^2$

(C) $(1/2)mn\alpha R^2$ (D) $mn\alpha R^2$

103. A body of mass m is moving in a circle of radius r with a constant speed v. The force on the body is equal to mv^2/r and is directed towards the centre. What is the work done by this force in moving the body over half the circumference of the circle

(A) $\frac{mv^2}{\pi r^2}$ (B) zero

(C) $\frac{mv^2}{r^2}$ (D) $\frac{\pi r^2}{mv^2}$

104. A force $F=\left(5\hat{i}+3\hat{j}\right)$ Newton is applied over a particle which displaces it from its origin to the point $r=\left(2\hat{i}-1\hat{j}\right)$ metres. The work done on the particle is

(A) – 7 joules (B) + 13 joules

(C) + 7 joules (D) + 11joules

105. A mass of M kg is suspended by a weightless string. The horizontal force that is required to displace it until the string makes an angle of 45° with the initial vertical direction is

(A) $Mg\left(\sqrt{2}-1\right)$ (B) $Mg\left(\sqrt{2}+1\right)$

(C) $Mg\sqrt{2}$ (D) $\frac{Mg}{\sqrt{2}}$