FIITJEE

ALL INDIA TEST SERIES

CONCEPT RECAPITULATION TEST – II

JEE (Main)-2019

Time Allotted: 3 Hours **Maximum Marks: 360**

General Instructions:

- The test consists of total 90 questions.
- Each subject (PCM) has 30 questions.
- This question paper contains **Three Parts.**
- **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
- Each part has only one section: **Section-A**.

  Section-A (01 – 30, 31 – 60, 61 – 90) *contains 90 multiple choice questions which have* ***only one correct answer****. Each question carries* ***+4 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

Physics

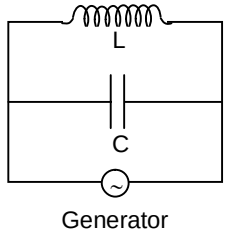
PART – I

SECTION – A
(One Options Correct Type)

This section contains **30 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

1. The rms value of the electric field of the light coming from the sun is 720 N/C. The average total energy density of the electromagnetic wave is
   (A) 4.58×10^{-6} J/m^3 (B) 6.37×10^{-9} J/m^3
   (C) 81.35×10^{-12} J/m^3 (D) 3.3×10^{-3} J/m^3

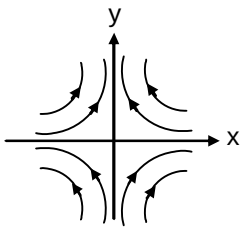
2. For the circuit shown in the figure, the current through the inductor is 0.6 A, while the current through the capacitor is 0.4 A. The current drawn from the generator is
   (A) 1.0 A (B) 0.4 A
   (C) 0.6 A (D) 0.2 A

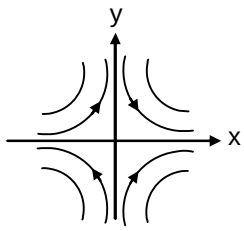


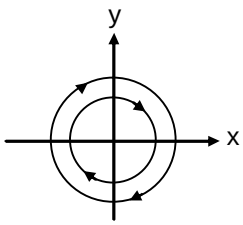
3. In forced oscillation of a particle, the amplitude is maximum for a frequency ω_1 of the force, while the energy is maximum for a frequency ω_2 of the force, then
   (A) $\omega_1 = \omega_2$
   (B) $\omega_1 > \omega_2$
   (C) $\omega_1 < \omega_2$ when damping is small and $\omega_1 > \omega_2$ when damping is large.
   (D) $\omega_1 < \omega_2$

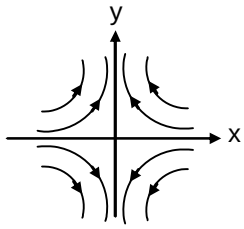
Space for Rough work

4. Electric potential is varying with x and y as $V = 2\left(x^2 - y^2\right)$. The corresponding field pattern is:

(A) 

(B) 

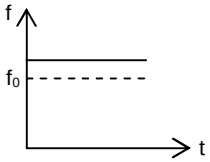
(C) 

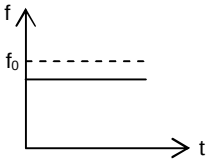
(D) 

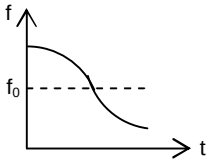
5. Two point white dots are 1 mm apart on a black paper. They are viewed by eye of pupil diameter 3 mm. Approximately, what is the maximum distance at which these dots can be resolved by the eye? (Take wavelength of light = 500 nm)

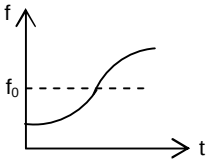
(A) 5 m (B) 1 m
(C) 6 m (D) 3 m

6. Source and observer both start moving simultaneously from origin one along x-axis and the other along y-axis with speed of source = 2 (speed of observer). The graph between the apparent frequency observed by observer (f) and time (t) would be (dotted lines represent frequency of source f_0)

(A) 

(B) 

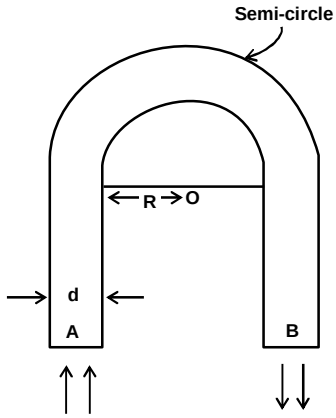
(C) 

(D) 

Space for Rough work

7. Curie temperature is the temperature above which:
(A) a ferromagnetic material becomes paramagnetic.
(B) a paramagnetic material becomes diamagnetic.
(C) a ferromagnetic material becomes diamagnetic.
(D) a paramagnetic material becomes ferromagnetic.

8. A glass rod (μ = 1.5) of square cross-section is bent into the shape shown in the figure. A parallel beam of light falls perpendicularly on the plane flat surface A. Referring to the diagram, d is the width of a side and R is the radius of inner semi-circle. The maximum value of ratio (d/R) so that all light entering the glass through surface A emerge from the glass through surface B is
(A) 1/2 (B) 2/3
(C) 3/2 (D) 2/1

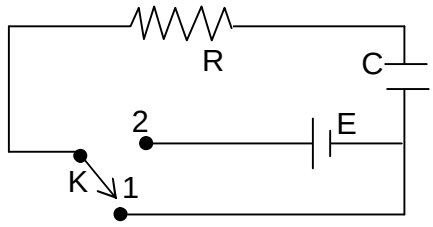


9. A train of mass M is moving on a circular track of radius R with constant speed v. The length of train is half the perimeter of track. The linear momentum of the train will be
(A) 0 (B) $2M\nu/\pi$
(C) MvR (D) Mv

10. A cube of side a is placed on an inclined plane of inclination θ. What is the maximum value of θ for which cube will not topple?
(A) 15^0 (B) 30^0
(C) 45^0 (D) 60^0

Space for Rough work

11. In the shown circuit involving a resistor of resistance R Ω, capacitor of capacitance C farad and an ideal cell of emf E volt, the capacitor is initially uncharged and the key is in position 1. At t = 0 second the key is pushed to position 2 for t_0 = RC seconds and then key is pushed bank to position 1 for t_0 = RC seconds. This process is repeated again and again. Assume the time taken to push key from position 1 to 2 and vice versa to be negligible.



The charge on capacitor at t = 2RC second is

(A) CE

(B) $CE\left(1-\frac{1}{e}\right)$

(C) $CE\left(\frac{1}{e}-\frac{1}{e^2}\right)$

(D) $CE\left(1-\frac{1}{e}+\frac{1}{e^2}\right)$

12. Two polaroids are placed in the path of unpolarized beam of intensity I_0 such that no light is emitted from the second polaroid. If a third Polaroid whose polarization axis makes an angle θ with the polarization axis of first Polaroid, is placed between these polaroids then the intensity of light emerging from the last polaroid will be

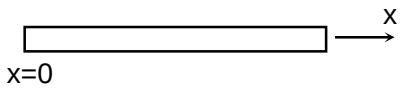
(A) $\left(\frac{I_0}{8}\right)\sin^2 2\theta$

(B) $\left(\frac{I_0}{4}\right)\sin^2 2\theta$

(C) $\left(\frac{I_0}{2}\right)\cos^4\theta$

(D) $I_0\cos^4\theta$

13. If along a uniform rod of length ℓ carrying current I, the voltage V changes with position x along the length of the rod such that dV/dx = – k, where k is a positive number, then the resistance of the rod is



(A) $k\ell/2I$

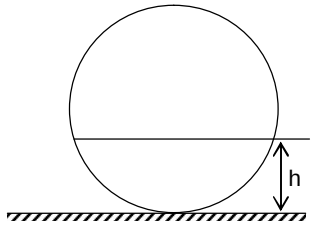
(B) $k\ell/I$

(C) $I/k\ell$

(D) $k\ell I$

Space for Rough work

14. A liquid is filled in a spherical container of radius R till a height h. At this positions the liquid surface at the edges is also horizontal. The contact angle is



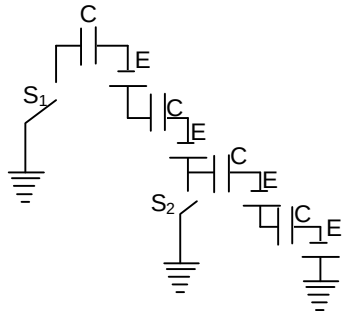
(A) 0

(B) $\cos^{-1}\left(\frac{R-h}{R}\right)$

(C) $\cos^{-1}\left(\frac{h-R}{R}\right)$

(D) $\sin^{-1}\left(\frac{R-h}{R}\right)$

15. In the given circuit, all the capacitors are initially uncharged. After closing the switch S_1 for a long time suddenly S_2 is also closed and kept closed for a long time. Total heat produced after closing S_2 will be :



(A) $4C\varepsilon^2$

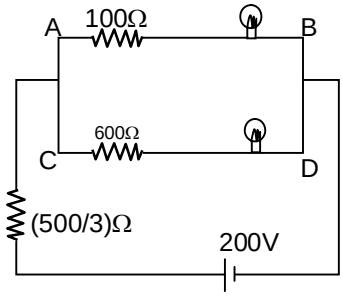
(B) $\frac{1}{2}C\varepsilon^2$

(C) $2C\varepsilon^2$

(D) 0

16. Two bulbs 25W, 100V (upper bulb in figure) and 100W, 200V (lower bulb in figure) are connected in the circuit as shown in figure. Choose the correct answer.

(A) Heat lost per second in the circuit will be 80J
(B) Ratio of heat produced per second in bulbs will be 1: 1
(C) Ratio of heat produced in branch AB to branch CD will be 1:2
(D) Current drawn from the cell is 0.2 A



17. A uniform sphere of radius r rolls without slipping down the top of a sphere of radius R. The initial velocity of the sphere is negligible. The angular velocity of the fixed sphere at the moment when it breaks off from the other sphere is

(A) $\sqrt{\frac{10g(R+r)}{17r^2}}$

(B) $\sqrt{\frac{17g(R+r)}{10r^2}}$

(C) $\sqrt{\frac{5g(R+r)}{10r^2}}$

(D) $\sqrt{\frac{5g(R+r)}{11r^2}}$

Space for Rough work

18. The first overtone of an open organ pipe beats with the first overtone of a closed organ pipe with a beat frequency of 2.2 Hz. The fundamental frequency of the closed organ pipe is 110 Hz. The lengths of the pipes are
(A) 1.1 m, 0.9 m (B) 1.2 m, 0.8 m
(C) 1.0067 m, 0.9937 m (D) 2.0067 m, 0.9937 m

19. A particle starts from rest and travels a distance s with uniform acceleration, then it travels a distance 2s with uniform speed finally it travels a distance 3s with uniform retardation and comes to rest. If the complete motion of the particle is a straight line then the ratio of its average velocity to maximum velocity is
(A) 6/7 (B) 4/5
(C) 3/5 (D) 2/5

20. The velocity of a particle varies with time as $\vec{v} = 3\hat{i} + (4 - 5t)\hat{j}$ m/s. Find the average velocity of the particle for a time interval between t = 0 and a time when the speed of the particle becomes minimum.
(A) $\left(3\hat{i} + 2\hat{j}\right)$ m/s (B) $\left(6\hat{i} + 5\hat{j}\right)$m / s
(C) $\left(4\hat{i} + \hat{j}\right)$m / s (D) $\left(3\hat{i} - 5\hat{j}\right)$m / s

21. The resistivity of pure silicon is 2300 Ω-m and the mobilities of electrons and holes in it are 0.135 and 0.048 m^2/V-s respectively. The resistivity of a specimen of silicon doped with
10^{19} atoms of phosphorus per meter will be
(A) 4.6 Ω m (B) 4 Ω m
(C) 4.4 Ω m (D) 0 Ωm

22. A perfectly absorbing surface intercepts a parallel beam of monochromatic light of power 10 W (λ = 500 nm) incident on it normally the force exerted by light beam on the surface is
(A) $\frac{1}{4}\times10^{-7}$N (B) $\frac{1}{3}\times10^{-7}$N
(C) $\frac{1}{2}\times10^{-7}$N (D) 1 × 10^{-7} N

Space for Rough work

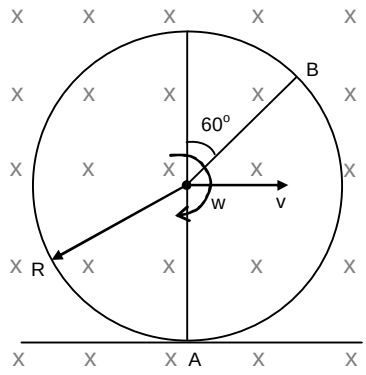
23. A mixture of two gases X and Y is enclosed at constant temperature. The relative molecular mass of X, which is diatomic, is 8 times that of Y which is monoatomic. What is the ratio of the rms speed of molecules of Y to that of molecules of X?
(A) 2 (B) $2\sqrt{2}$
(C) 4 (D) 8

24. In a photodiode the conductivity increases when light of wavelength less than 620 nm is incident. The band gap is
(A) 1.12 eV (B) 1.8 eV
(C) 2.0 eV (D) 1.62 Ev

25. Two narrow cylindrical pipes A and B have the same length. Pipe A is open at both ends and is filled with a monatomic gas of molar mass M_A. Pipe B is open at one end and closed at the other end, and is filled with a diatomic gas of molar mass M_B. Both gases are at the same temperature. If the frequency of the second harmonic in pipe A is equal to the frequency of the third harmonic in pipe B, what is the value of M_A/M_B?
(A) $\frac{100}{189}$ (B) $\frac{200}{189}$
(C) $\frac{400}{189}$ (D) $\frac{500}{189}$

26. The efficiency of a Carnot cycle is 1/6. If on reducing the temperature of the sink by 65^0C, the efficiency becomes 1/3, the initial temperatures between which the cycle is working are
(A) 390 K, 325 K (B) 780 K, 325 K
(C) 390 K, 162 K (D) 300 K, 100 K

27. A conducting wheel is rolling on the ground in a uniform magnetic field B_o then the emf induced between points A and B; $V_A - V_B$ will be
(A) $B_o w^2(\sqrt{3}R)$
(B) $-\frac{\sqrt{3}}{2}Bw^2R$
(C) $B_o w^2\sqrt{2}R$
(D) $-B_o w^2\left(\frac{\sqrt{5}}{2}\right)R$



Space for Rough work

28. In a radioactive reaction an unstable nucleus A dis-integrates into a stable nucleus B. But A is generated at a constant rate of q nucleus per second. Then at steady state number of nucleus of A will be

$q\ (sec^{-1}) \longrightarrow \underset{\text{(Parent Nucleus)}}{A} \xrightarrow{\lambda} \underset{\text{(Daughter Nucleus)}}{B}$

(A) $q\lambda$ (B) $\frac{q}{\lambda}$

(C) $q - \lambda$ (D) $\frac{\lambda}{q}$

29. A 200 W and a 100 W bulb, both meant for operation at 220 V are connected to a 220 V supply.
(A) Total power consumed by them will be 150 W, if they are in series
(B) Total power consumed by them will be (200/3) W, if they are in series
(C) Total power consumed by them will be 150 W, if they are in parallel
(D) Total power consumed by them will be (200/3) W, if they are in parallel

30. At a place the angle of dip is 30°. If the horizontal component of the earth's magnetic field is H, then the total field intensity will be given by

(A) H/2 (B) $2H/\sqrt{3}$

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

Space for Rough work

Chemistry

PART – II

SECTION – A
(One Options Correct Type)

This section contains **30 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

31. The energy of the first orbit of hydrogen atom is -13.6 eV. How much minimum amount of energy is required to ionize a gaseous hydrogen atom to a gaseous H^+ ion?
(A) Greater than 13.6 eV (B) Less than 13.6 eV
(C) Equal to 13.6 eV (D) Greater than 13.6 eV & less than 17 eV

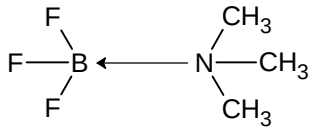
32. For which of the following reversible reaction, pressure has not effect on the state of equilibrium?
(A) $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$ (B) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(C) $S(s) + O_2(g) \rightleftharpoons SO_2(g)$ (D) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

33. $(P) \xrightarrow{\text{Radioactive disintegration}} {}^{3}_{2}He + \beta\text{-ray}$
The element or compound (P) in the above reaction is:
(A) protium (B) deuterium
(C) tritium (D) helium

34. Drugs that reduce body temperature are called
(A) analgesics (B) antipyretics
(C) antibiotics (D) hipnotics

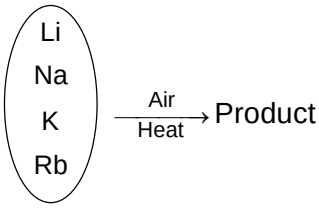
Space for Rough work

35. Choose the correct statement regarding the following molecule



(A) $\angle$FBF bond angle is 120^o
(B) Nitrogen undergoes sp^2 hybridization
(C) $p\pi$ - $p\pi$ back bond between B & F in the molecule is more dominant than that in isolated BF_3 molecule
(D) All central atoms have the same type of hybridization

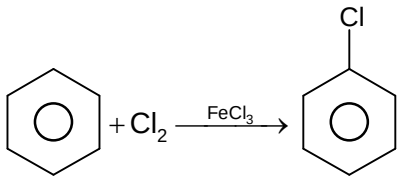
36. The pH of 0.01 M NaCl is identical to that of
(A) 0.01 M Na_2CO_3 (B) 0.01 M NaOH
(C) 0.01 M KNO_3 (D) 0.01 M $KHCO_3$

37. 

Which product is not formed in the above reaction?
(A) Na_2O_2 (B) Li_3N
(C) KH (D) RbO_2

38. In a reaction, the time taken for 75% completion of the reaction is two times of that taken for 50% completion of the reaction. What is the order of reaction?
(A) Zero (B) First
(C) Second (D) Third

Space for Rough work

39. 

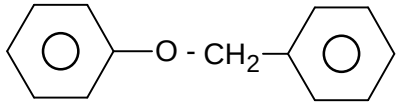
The species that attacks the benzene ring in the above reaction is:

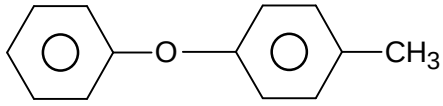
(A) Cl^- (B) Cl^+

(C) $\dot{C}l$ (D) $\ddot{C}l$

40. Which ether forms the maximum no. of product(s) with HI?

(A) $CH_3OCH_2CH_3$ (B) $CH_3CH_2OCH_2CH_3$

(C) 

(D) 

41. Which halide of boron has the highest thermal stability?

(A) BF_3 (B) BCl_3

(C) BBr_3 (D) BI_3

42. Which of the following compounds(s) containing asymmetric carbon atoms can rotate plane polarized light?

(I) Dexotro rotatory (II) Racemic mixture

(III) Diastereomers (IV) Meso compounds

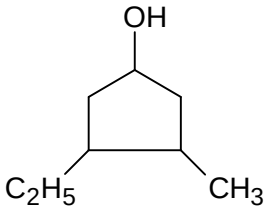
Choose the correct code

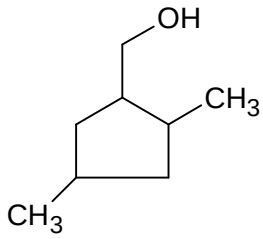
(A) I, II (B) II, IV

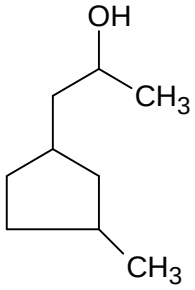
(C) I, III (D) I, IV

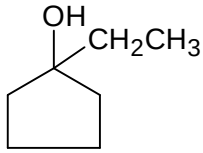
Space for Rough work

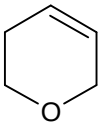
43. Which alcohol forms a derivative of cyclohexene upon dehydration reaction?

(A) 

(B) 

(C) 

(D) 

44.  does not form cyclic product when reacts with

(A) Cl_2/CCl_4 (B) HCl
(C) H_2/Ni (D) Br_2/CS_2

45. Which of the following forms a primary alcohol when reacts with Grignard's reagent?
(A) CH_3CHO (B) HCHO
(C) CH_3COCH_3 (D) CH_3COOH

46. The incorrect statement regarding glycine is
(A) it is the simplest α-amino acid (B) it contains two functional groups
(C) it contains a chiral carbon atom (D) it can exist as zwitter ion

47. Which reagent is used to check phenolic functional group?
(A) Lucas reagent (B) $FeCl_3$
(C) 2, 4-DNP (D) NH_4OH

Space for Rough work

48. How many element(s) is/are present in Teflon?
(A) 4 (B) 2
(C) 3 (D) 6

49. $NH_4NO_2 \longrightarrow N_2 + 2H_2O$
The equivalent mass of NH_4NO_2 (molar mass = M) in the above reaction is:
(A) $\frac{M}{2}$ (B) M
(C) $\frac{M}{3}$ (D) $\frac{M}{4}$

50. The velocity possessed by maximum number of gas molecules in a layer of an ideal gas is represented by
(A) $\sqrt{\frac{3RT}{M}}$ (B) $\sqrt{\frac{2RT}{M}}$
(C) $\sqrt{\frac{8RT}{\pi M}}$ (D) $\sqrt{\frac{8RT}{M}}$

51. The most basic hydride of gr-15 elements is:
(A) NH_3 (B) PH_3
(C) AsH_3 (D) BiH_3

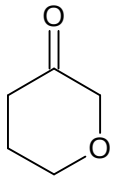
52. The gases evolved when carbon reacts with conc.H_2SO_4 is/are
(A) CO_2 and SO_2 (B) CO, CO_2 and SO_3
(C) CO_2 and SO_3 (D) CO_2, SO_2 and H_2S

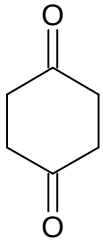
53. The most acidic oxide of chlorine is
(A) Cl_2O (B) ClO_2
(C) Cl_2O_3 (D) Cl_2O_7

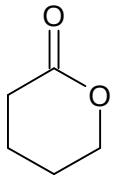
54. What is the hybridization of xenon in XeO_4?
(A) sp^3 (B) sp^3d
(C) sp^3d^2 (D) sp^3d^3

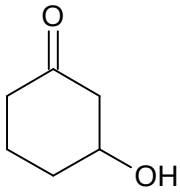
Space for Rough work

55. Which of the following compound does not react with $NaBH_4$?

(A) 

(B) 

(C) 

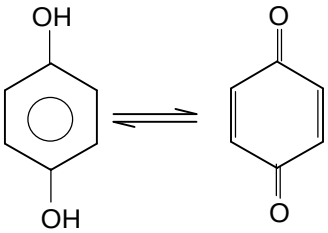
(D) 

56. The CHO group of D-glucose will be only converted to COOH group when it reacts with
(A) conc.HI/red P (B) Br_2/H_2O
(C) $PhNHNH_2$ (D) conc.H_2SO_4

57. An aqueous solution of a gas X change the colour of an acidified $K_2Cr_2O_7$ solution. On passing H_2S gas through the solution of X, a white turbidity is obtained . The gas X is
(A) NH_3 (B) SO_2
(C) CO_2 (D) SO_3

58. Which of the following substance has zero standard enthalpy of formation at room temperature?
(A) liquid H_2 (B) liquid N_2
(C) liquid Br_2 (D) liquid Cl_2

59. The cell reaction involving quinhydrone electrode is

 $+ 2H^+ + 2e^-, E^0 = 1.30V$

What will be the electrode potential at pH =3
(A) 1.48 V (B) 1.20 V
(C) 1.10 V (D) 1.30 V

60. The number of tetrahedral and octahedral voids in hexagonal primitive unit cell are:
(A) 8, 4 (B) 2, 1
(C) 12, 6 (D) 6, 12

Space for Rough work

Mathematics

PART – III

SECTION – A
(One Options Correct Type)

This section contains **30 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

61. If combined equation of two sides AB and AC of a triangle is $x^2 - xy - 2y^2 + x + y = 0$ and (1, 1) is orthocenter, then circum – radius of ΔABC is

(A) $\frac{5\sqrt{2}}{3}$ (B) $\frac{10\sqrt{2}}{3}$

(C) $\frac{3\sqrt{2}}{5}$ (D) $\frac{3}{10\sqrt{2}}$

62. Two variable chords AB and BC of a circle $x^2 + y^2 = a^2$ are such that AB = BC = a, then locus of point of intersection of tangents at A and C is a circle of radius

(A) $a\sqrt{2}$ (B) 2a

(C) 4a (D) none of these

63. Suppose x and y are real numbers and that $x^2 + 9y^2 - 4x + 6y + 4 = 0$ then the minimum value of (4x – 9y) is

(A) 1 (B) 4

(C) 5 (D) 6

64. A hyperbola has focus at origin, its eccentricity is $\sqrt{2}$ and corresponding directrix is $x + y + 1 = 0$. The equation of one of its asymptotes is

(A) $x + 1 = 0$ (B) $x - 2 = 0$

(C) $y - 1 = 0$ (D) $y - 2 = 0$

Space for Rough work

65. The latus rectum of conic is 6 and its eccentricity is $\frac{1}{2}$. Then the length of focal chord making an angle 45^o with the major axis is
(A) less than 6 (B) greater than 6
(C) less than 7 (D) greater than 8

66. A normal to the hyperbola $\frac{x^2}{4}-\frac{y^2}{1}=1$, has equal intercepts on positive x and y – axes. If this normal touches the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then find $\frac{9}{25}\left(a^2+b^2\right)$.
(A) 1 (B) 2
(C) 3 (D) 4

67. If $c \in R$ and the negative for one of the solutions of $x^2-3x+c=0$ is a solution of $x^2+3x-c=0$, then the smallest solution of $x^2-3x+c=0$ is
(A) -1 (B) 1
(C) 0 (D) 3

68. If $1 + 2 + 3 + \ldots\ldots + 49 = x$, then $1^3 + 2^3 + 3^3 + \ldots\ldots + 49^3$ is given by
(A) x^3 (B) x^2
(C) $x^2 + x$ (D) $x^3 + x^2$

69. Number of solutions of $z \in C$ with $|z|=1$ and $\left|\frac{z}{\bar{z}}+\frac{\bar{z}}{z}\right|=1$ is
(A) 2 (B) 4
(C) 6 (D) 8

70. The coefficient of x^{32} in the expansion of $\left((1+x)(2+x)(3+x)\right)^{10}(2+x)(3+x)^2$ is
(A) 60 (B) 64
(C) 68 (D) none of these

Space for Rough work

71. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = x_1\hat{i} + x_2\hat{j} + x_3\hat{k}$, where $x_1, x_2, x_3 \in \{-3, -2, -1, 0, 1, 2\}$. Number of possible vectors $\vec{b}$ such that $\vec{a}$ and $\vec{b}$ are mutually perpendicular, is
(A) 25 (B) 28
(C) 22 (D) None of these

72. Let $f(\theta) = \cos\theta \cos 2\theta \cos 3\theta \cos 4\theta \cos 5\theta \cos 6\theta$ and $f\left(\frac{2\pi}{13}\right) = P$. Find value of $2^8|P|$
(A) 2 (B) 4
(C) 6 (D) 8

73. In a triangle ABC, $b + c = 2a$ and $\angle A = 60^\circ$. Let O be an interior point and its distance from three sides 3,4,5 units , then circum radius of triangle ABC is
(A) 2 (B) 4
(C) 8 (D) 16

74. If $\sum_{k=1}^{n} \tan^{-1}\frac{2k}{2 + k^2 + k^4} = \tan^{-1}\left(\frac{6}{7}\right)$, then the value of 2n is equal to
(A) 2 (B) 4
(C) 6 (D) 8

75. The number of pairs of integer (x, y) that satisfy the following two equations
$\begin{cases}\cos(xy) = x \\ \tan(xy) = y\end{cases}$ is
(A) 1 (B) 2
(C) 4 (D) 6

Space for Rough work

76. Consider the function $f(x)$ satisfying the identity $f(x)+f\left(\frac{x-1}{x}\right)=1+x,\ \forall x\in R-\{0,1\}$ and $g(x)=2f(x)-x+1$. Then the domain of $y=\sqrt{g(x)}$ is

(A) $\left(-\infty, \frac{1-\sqrt{5}}{2}\right]\cup\left[1, \frac{1+\sqrt{5}}{2}\right]$ (B) $\left(-\infty, \frac{1-\sqrt{5}}{2}\right]\cup(0,1)\cup\left[\frac{1+\sqrt{5}}{2}, \infty\right)$

(C) $\left[\frac{-1-\sqrt{5}}{2}, 0\right]\cup\left[\frac{-1+\sqrt{5}}{2}, 1\right]$ (D) $\left[\frac{1-\sqrt{5}}{2}, 0\right)\cup\left[1, \frac{1+\sqrt{5}}{2}\right]$

77. If $y=\frac{2x+5}{3x+10}$ and $2\left(\frac{dy}{dx}\right)\left(\frac{d^3y}{dx^3}\right)=k\left(\frac{d^2y}{dx^2}\right)^2$ then k =

(A) 1 (B) 2
(C) 3 (D) 4

78. If $f(x)$ is continuous such that

$f(x)=f(3x-4y)+f(4y-2x)-(3x-4y)(4y-2x)\ \forall x,y\in R$ and $\lim_{h\to 0}\frac{f(h)}{h}=4$, then $f'(2)$ is

(A) 1 (B) 2
(C) 3 (D) 4

79. The angle at which curve $y=ke^{kx}$ intersects the y axis is

(A) $\tan^{-1}(k^2)$ (B) $\cot^{-1}(k^2)$

(C) $\sin^{-1}\frac{1}{k^2}$ (D) none of these

80. If $Y=\tan^{-1}\frac{1}{1+x+x^2}+\tan^{-1}\frac{1}{3+3x+x^2}+\tan^{-1}\frac{1}{7+5x+x^2}+$ ……..upto n terms then Y'(0) is equal to :

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

(C) $\frac{n}{1+n^2}$ (D) None of these

Space for Rough work

81. The side of a triangle are in the ratio 3:5 and the third side is 16, if the largest possible area of the triangle is
(A) 120 (B) 230
(C) 130 (D) 240

82. Let $f:[0,1]\to[0,\infty)$ be a real valued continuous function such that
$\left(f(t)\right)^2 \le 1+2\int_0^t f(u)\,du \;\forall\, t\in[0,1]$, then which of the following is (are) correct?
(A) $f\left(\frac{1}{2}\right)\le\frac{5}{2}$ (B) $f\left(\frac{3}{4}\right)\ge\frac{7}{4}$
(C) $\int_0^{3/4} f(u)\,du > \frac{33}{32}$ (D) $\int_0^{1/2} f(u) \le \frac{5}{8}$

83. $\int e^x\left(\frac{2\tan x}{1+\tan x}+\cot^2\left(x+\frac{\pi}{4}\right)\right)dx$ is equal to
(A) $e^x\tan\left(\frac{\pi}{4}-x\right)+c$ (B) $e^x\tan\left(x-\frac{\pi}{4}\right)+c$
(C) $e^x\tan\left(\frac{3\pi}{4}-x\right)+c$ (D) none of these

84. If y = f(x) satisfies the condition f(x) = f(4 – x) $\forall$ x □ (0, 4), f(x) = f(14 – x) $\forall$ x □ [4, 10],

$$f(x)=\begin{cases}[x^2-2x+5], & x\in(0,1]\\ 3+\sqrt{2x-x^2}, & x\in(1,2]\\ \frac{20-2x}{3}, & x\in[4,7]\end{cases}$$

Then the area bounded by y = f(x), x = 0, x = 10 and the x-axis is
(A) $\frac{\pi}{2}+16$ (B) $\frac{\pi}{2}+20$
(C) $\frac{\pi}{2}+32$ (D) None of these

Space for Rough work

85. A six faced die is so biased that it is twice as likely to show on even number as an odd number when thrown. It is thrown twice then probability that the sum of the two numbers thrown is even is
(A) 1/3 (B) 5/9
(C) 7/9 (D) none of these

86. If $bx^2 + ax + c = 0$, $ax^2 + bx + c = 0$ and $ax^2 + cx + b = 0$, each equation has equal roots, then $\begin{vmatrix} 3 & a & bc \\ 3 & b & ac \\ 3 & c & ab \end{vmatrix}$ is equal to
(A) $3(a-b)(b-c)(c-a)$ (B) $\frac{3}{4}(a-b)(b-c)(c-a)$
(C) 3 abc (D) abc

87. If A is a skew symmetric matrix of order $2\&B,C$ are matrices $\begin{bmatrix} 1 & 4 \\ 2 & 9 \end{bmatrix}, \begin{bmatrix} 9 & -4 \\ -2 & 1 \end{bmatrix}$, then $A^3BC + A^5\left(B^2C^2\right) + A^7\left(B^3C^3\right) + ...A^{2017}\left(B^{1009}C^{1009}\right)$ is
(A) a symmetric matrix (B) an identity matrix
(C) a skew symmetric matrix (D) None of these

88. If $\vec{a},\vec{b},\vec{c}$ are unit vectors, then the maximum value of $\left|\vec{a}-2\vec{b}\right|^2 + \left|\vec{b}-2\vec{c}\right|^2 + \left|\vec{c}-2\vec{a}\right|^2$ is
(A) 21 (B) 22
(C) 23 (D) 24

89. The volume of the parallelepiped whose coterminous edges are represented by the vectors $4\vec{b}\times\vec{c}$, $3\vec{c}\times\vec{a}$ and $8\vec{a}\times\vec{b}$, where $\vec{a} = (1+\sin\theta)\vec{i} + \cos\theta\vec{j} + \sin 2\theta\vec{k}$,
$\vec{b} = \sin\left(\theta + \frac{2\pi}{3}\right)\vec{i} + \cos\left(\theta + \frac{2\pi}{3}\right)\vec{j} + \sin\left(2\theta + \frac{4\pi}{3}\right)\vec{k}$ and
$\vec{c} = \sin\left(\theta - \frac{2\pi}{3}\right)\vec{i} + \cos\left(\theta - \frac{2\pi}{3}\right)\vec{j} + \sin\left(2\theta - \frac{4\pi}{3}\right)\vec{k}$, is 18 cubic units, then $\left|\cos 3\theta\right| =$
(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$
(C) 1 (D) none

90. The negation of $\sim s \vee (\sim r \wedge s)$ is equivalent to :
(A) $s \wedge (r \wedge \sim s)$ (B) $s \vee (r \vee \sim s)$
(C) $s \wedge r$ (D) $s \wedge \sim r$

Space for Rough work