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IITH UGEE 2023 Question Paper PDF

International Institute of Information Technology Undergraduate Entrance
Examination (IITH UGEE)

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UGEE 2023 MEMORY BASED PAPER

UGEE 2023 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2023	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS

TOTAL MARKS : 150

Q1. There are 4 different hairstylists and they have 4 clients. Every hairstylist charges some more money from their clients.

Name of clients: Raju, Babu, Ayush, Akash

Name of hairstylists: Rahul, Lokesh, Wadeel, Dev

Fees: 150Rs, 160Rs, 170Rs, 180Rs

- Raju paid more than Rahul's client.
- Babu paid 20 Rs more than Dev's client.
- Raju paid 10 Rs less than Lokesh's client.
- Rahul's clients, Raju, and Babu are all different persons.
- Either Rahul's client or Babu who paid the highest amount of money.

Who paid how much money to whom?

- Raju paid 150Rs to Wadeel, Babu paid 160 Rs to Rahul, Ayush paid 170Rs to Lokesh, and Akash paid 180Rs to Dev.
- Babu paid 150Rs to Dev, Raju paid 160 Rs to Wadeel, Ayush paid 170Rs to Lokesh, and Akash paid 180Rs to Rahul.
- Ayush paid 150Rs to Rahul, Akash paid 160 Rs to Dev, Raju paid 170Rs to Wadeel, and Babu paid 180Rs to Lokesh.
- Akash paid 150Rs to Lokesh, Ayush paid 160 Rs to Rahul, Babu paid 170Rs to Dev, Raju paid 180Rs to Wadeel

Q2. Water is essential for the germination of seeds and the growth of plants. Why does excess watering kill the plants and rot the seeds?

- Excess water speeds up the process of life and therefore the plants die.

- Excess of water means excess of salts dissolved in it. These salts poison the plant and kill it.
- Excess water restrains and cuts off the supply of oxygen that roots rely upon to work appropriately.
- Excess water rots the seeds.
- All of the above.

Passage-based question:

For shooting a skydiving stunt for a movie, the Male skydiver will jump first then the Female skydiver will follow him and during the fall, the female skydiver has to reach the male skydiver. Answer the following question

Q3. How much does the second diver jump for him to reach the first diver

- Bend the body close to reduce air resistance
- stretch the body to increase the acceleration due to gravity
- Tuck into a ball to decrease air drag.
- Extend limbs outward to catch more air and slow down.
- Maintain a neutral body posture for optimal control.

Q4. Comments about the acceleration and velocity of divers

- Velocity decreases as they go down
- Acceleration due to gravity increases as they go down
- They achieve a terminal velocity after some time
- No velocity

Q5. The direction of acceleration immediately changes _____ after the divers open their parachutes.

- A. Downward
- B. Upward
- C. Upward then Downward
- D. Downward then Upward

Passage-based Question:

Women are always neglected when it comes to health and nutrition. In many countries, the men and women ratio is less because women are not getting as much nutrition and medical care compared to men. In India, death just after giving birth is very common for women of every age. This is only because of neglecting the proper care of women. The man-woman ratio in some of the rich states of India like Punjab, Haryana, etc., is very low compared to Kerala, which has a man-woman ratio similar to Japan, etc. This condition is different in the countries of the 'third world'.

Although using the term Third World is not useful because there is no certainty of the men-women ratio in different countries.

Q6. What makes Kerala more special than the northern states?

- A. It's the literacy of the people
- B. It matches the developed countries in terms of men-women ratio
- C. There is nothing special about it
- D. None of the above

Q7. Why is the men-women ratio less in some countries like India?

- A. Men live longer than women
- B. It's just bad luck
- C. Women are not provided with proper nutrition and medical care
- D. Insufficient data

Q8. The concept of 'Third World' is useless for the author. Why?

- A. it's not good to discriminate against other countries by saying 3rd world
- B. There is more diversity in other countries
- C. Third-world countries are developed countries
- D. None of the given options are correct

Q9. If the semimajor axis of Earth is 1. Then how much time would it take for a planet with a semimajor axis 40 to complete one revolution?

- A. 10 yrs
- B. 40 yrs
- C. 254 yrs
- D. 342 yrs

E. None

Q10. ${}^{28}C_{2r} : {}^{24}C_{(2r-2)} = 225:11$.

Then the value of r is

- A. 7
- B. 4
- C. 6
- D. 9
- E. None of the Above

Q11. Which of the following is one-one and onto?

- A. $A: N \rightarrow N, f(x) = x^2$
- B. $A: N \rightarrow N, f(x) = x^4$
- C. $A: Z \rightarrow Z, f(x) = x^2$
- D. $A: Z \rightarrow Z, f(x) = x^3$
- E. None

Q12. If $\frac{d^2y}{dx^2} = \cos \frac{dy}{dx}$, Find the order and the degree of the resulting differential equation.

- A. Order 2 degree 4
- B. Cannot be determined
- C. Order 3 degree 1
- D. Data Insufficient
- E. None of these

Q13. Find the area enclosed between the parabolas $x=y^2$ and $y=x^2$?

Q14. $f(x)=|x|$ if is a real function, then the function is

- A. One-one function but not an onto function
- B. One-one and onto function
- C. Many - one function but not an onto function
- D. Many - one function and an onto function

Q15. Three balls A, B, and C are thrown with the same initial velocity one upwards, one Downwards, and one horizontally, what are the final velocities of the all bodies when they hit the ground?

- A. $V_a > V_b > V_c$
- B. $V_b = V_c > V_a$
- C. $V_c > V_b > V_a$
- D. $V_a = V_b = V_c$

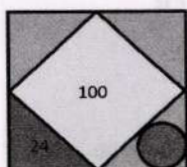
Q16. Which of the following when mixed will not form a buffer solution?

- A. 100ml 0.1 M NaOH + 50ml 0.1 M CH_3COOH
- B. 50ml 0.1 M NaOH + 100ml 0.1 M CH_3COOH
- C. 50ml 0.1 M NH_4OH + 50ml 0.1 M CH_3COOH
- D. 50ml 0.1 M HCl + 100ml 0.1 M CH_3COONa

Q17. If $f(x) = \frac{1}{\sqrt{1-x^2}}$, then find $\int f(x)dx = ?$

- A. $\tan^{-1} x + C$
- B. $\sin^{-1} x + C$
- C. $\cos^{-1} x + C$
- D. $-\cos^{-1} x + C$
- E. None of these

Q18. Find the radius of the circle if the area of the inscribed square is 100 sq. units and the triangle is 24 sq. units



- A. 10
- B. 14
- C. 2
- D. 7
- E. None of these

Q19. How many minimum no. of $1\ \Omega$ resistors are needed to obtain $7/6\ \Omega$ resistance when they are series and parallel?

- A. 7
- B. 5
- C. 2
- D. 6
- E. 3

Q20. Which forms buffer solutions?

- A. 50 ml and 0.1M of HCl and 100 ml and 0.1M NaOH
- B. 100ml and 0.5M Na_2CO_3 and 100ml and 0.5 NaOH

Q21. 3 consecutive terms r , $r+1$, and $r+2$ are in an AP of expansion $(1+x)^{14}$. What is the value of r ?

- A. 5 or 9
- B. 5 or 8
- C. 4 or 8

The second passage mentions the echolocation of bats (not much detail was given in the paragraph about it. The passage contains only 3-4 lines).

Q22. What is echolocation?

Q23. How do bats communicate through echolocation?

- A. using a particular frequency that only bats can hear (and similar options)

Q24. If a bat can hear up to frequencies 50 times more than humans then what is the range in which a bat can hear?

- A. 50- 100
- B. 500-100000
- C. 500-10000

Q25. How does echolocation make bats different from other species?

The third passage was about 2 pipes A and B. Pipe A is a shallow pipe with a base area of $1\ \text{m}^2$. Pipe B is a

tube of length 10 cm. Both the pipes are now heated and pipe A absorbs 1kcal of heat and b absorbs 10cal of heat. Now both of them are put together until they attain the same temperature.

Q26. Heat flows in which direction?

- A. a to b
- B. b to a
- C. They both have the same temperature
- D. heat does not flow

Q27. When both tubes join together and water is to be passed through them how will the water flow?

- A. Turbulent as they have different areas and temperature
- B. a to b
- C. b to a

Q28. Will the velocity of water change?

- A. when moving from a to b increases
- B. when moving from a to b decreases
- C. when moving from b to increases
- D. when moving from b to a decreases
- E. none

Q29. Find the missing term

4	7	7	3	a)9
	1	5	x	b) 2
5	x	6	1	c) 5
7	3	4	7	

Q31. There are cards with the top painted red, the other side painted black, and another card top painted black and the bottom painted red. The third card painted both sides black. What is the probability that the card selected is red?

- A. $1/52$
- B. $1/51$

Q32. 3 coins are tossed simultaneously. Let the event of E is getting "all 3 tails or heads", event F is "at least 2 heads" and event g is "at most 2 heads"

- A. All are independent of each other
- B. e and f are dependent and e and g are dependent but f and g are independent
- C. All 3 dependent on each other
- D. Any 2 statements taken will be dependent on each other

Q33. foci $(\pm 4,0)$, semi major axis, $(\pm 6,0)$. Equation of ellipse:

- A. $x^2/52 + y^2/36=1$
- B. $x^2/36 + y^2/52=1$
- C. $x^2/36 + y^2/20=1$
- D. $x^2/20 + y^2/36=1$
- E. None

Q34. Which element absorbs energy when an electron is added:

- A. Na
- B. F
- C. O
- D. N

Q35. Areas under the curve $y = x^2$ and $y = 4$?

Q36. Differentiate $\sec x$ wrt x

- A. $\sec(x)\tan(x)$
- B. $\sec(x)^2$
- C. $\sec(x)^2 \tan(x)$
- D. $\sec(x) \tan(x)^2$

Q37. $\int \frac{-1}{\sqrt{1-x^2}}$

- A. $\tan^{-1} x + C$
- B. $-\sin^{-1} x + C$
- C. $\cos^{-1} x + C$
- D. $-\cos^{-1} x + C$
- E. None of these

Q38. The arithmetic mean and geometric of the roots of the quadratic equation are 8 and 5 respectively. Which of the following quadratic equation is correct?

- A. $x^2 - 16x + 25$
- B. $x^2 + 8x + 10$
- C. $x^2 + 16x + 10$
- D. $x^2 - 8x + 25$
- E. None of these

Q39. If $\zeta = i\left(\frac{1-Z}{1+Z}\right)$

Where Z is any complex number, then which of the following is true?

- A. $|Z| > 1$ if and only if $\text{Im}(\zeta) > 0$
- B. $|Z| = 0$ if and only if $\text{Im}(\zeta) > 0$
- C. $|Z| < 1$ if and only if $\text{Im}(\zeta) > 0$
- D. $|Z| < 1$ if and only if $\text{Im}(\zeta) < 0$
- E. None of these

Q40. For which of the following definitions $f(x)$ is both injective and surjective?

- A. $f: Z \rightarrow Z, f(x) = x^3$
- B. $f: N \rightarrow N, f(x) = x^2$
- C. $f: Z \rightarrow Z, f(x) = x^2$
- D. $f: N \rightarrow N, f(x) = x^3$
- E. None of these

Q41. Find the missing term

7, 16, 25, ?, 43

- A. 34
- B. 30

C. 37

D. 36

Q42. $f(x) = x|x|$ will be

- E. Many One Onto
- F. One One Onto
- G. Many One Onto
- H. One One Into

Q43. A ball is thrown from a tower compare the velocities when it reached the ground

Cases: horizontally upward and downward

- A. Same
- B. Upward will be having more
- C. Downward will be having more
- D. None of the Above

Q44. What is the period of $\tan(\cos(x/2)/2)$

- A. π
- B. $\pi/2$
- C. 2π
- D. $\pi/4$

Q45. Two planets whose radii are in the ratio of r and orbital velocity in the ratio of r . Then the ratio of acceleration due to gravity will be

- A. V^2/R^2
- B. V^2/R
- C. $2V/R$
- D. $V^2/2R$
- E. None of the Above

Q46. Three objects of same radius r namely ring, sphere, cylinder are slid, then the ratio of maximum and minimum velocity of the object will be

Q47. There are 3 cards. One card is painted red on both sides. Second one is painted black on both sides. Third card is painted red on one side and black on the other side. If one card is drawn and was found to have red on one side, the probability that the other side is black is.

Q48. Three couples can be arranged in how many ways such that no person sits with his partner around a circular table

Q49. Data Sufficiency Problem

- i. Rahul watch shows the time 14 : 20
- ii. Deepika and Jaideep watch Shows same time
- iii. Jaideep watch is 10 min slower than Rahul
- iv. Zaara watch is small

- v. Zaara watch is 5 min fast than the Jaideep watch

Then Zaara watch shows the time 14:15

- A. False
- B. True
- C. we can't say
- D. None of these

Q50. Ques based on vector triple product. Which of the following is correct

- A. $(u \times v) \times w = u \times (v \times w)$
- B. $(u \times v) \cdot w = (u \cdot v) \cdot w$
- C. $(u \times v) \cdot w = u \times (v \cdot w)$

Q51. After studying the structure of an atom it can be concluded that,

- A. Most Part of our body is filled with vacuum
- B. We are alive because electrons revolve in fixed orbits.
- C. Most Part is filled by protons
- D. Most Part is filled by electrons
- E. Protons are dispersed and electrons are concentrated.

Q52. The time period and radius of a planet of radius 40 follow the usual Kepler's laws. If the radius of Earth was 1 then what is the time period of the planet?

- A. T
- B. $40^{3/2} T$
- C. $4^{3/2} T$
- D. None of the above

Q53. If the ratio of escape velocities of planets p and q is v and the ratio of radius is r what is the ratio of their acceleration due to gravity?

Q54. Acidic strength order of H_2SO_4 , $HClO_4$ and HIO_3 ?

Q55. How many structural isomers are there for C_6H_{14}

- A. 9
- B. 5
- C. 6
- D. 7
- E. None of these

Q56. The height of the object is 2 cm. The distance of the object from the concave mirror is 16. The height of the image is 3cm. What's the focal length of the mirror?

Q57. If the half-life of A = $1/2$ half-life of B. Then after 4 half-lives of B, what is the ratio of N_a and N_b where N_a and N_b are the numbers of molecules of A and B respectively?

Q58. What is the order and degree of the differential equation $d^2y/dx^2 = \cos x$?

Q59. When NaOH is taken in a cylindrical pot shape tube of $1m^2$ and HCl is taken in a cylindrical tube of diameter 1mm added methyl orange drops are in the cylindrical pot tube and both tubes are connected what happens

Q60. The value of $1/1! + 4/2! + 9/3! + 16/4! + \dots$

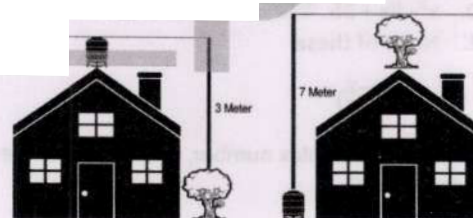
Q61. Find the value of $(125)^{\log_{25} 5}$

- A. 15
- B. 25
- C. $5\sqrt{5}$
- D. 3
- E. None

Q62. In a certain reaction, if the R isomer of a compound was converted into a new compound with configurations R and S. Then it must have followed which pathway

- A. E2 reaction
- B. E1 reaction
- C. SN1 reaction
- D. SN2 reaction

Q63. Find the height of the building.



- A. 3
- B. 2
- C. 5
- D. None of the above

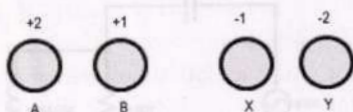
Q64. What is incorrect about benzene:

- A. All C-C bond lengths are different
- B. Prefers addition reaction over substitution
- C. It is an aromatic compound
- D. All the carbon atoms exhibit same characteristics

Q65. What is the concentration of H^+ ion in blood, given $PH = 7.40$

- A. 2.56
- B. 2.51
- C. 3.47
- D. 4.26

Q66. There are given anions and cations which will combine to form an ionic compound with the greatest lattice energy



- A. AY
- B. AX
- C. BX
- D. BY
- E. XY

Q67. A tank has 8 wheels. A bulldozer has 6 wheels and 2 pair of headlights and an excavator has 6 wheels and 1 pair of headlights. What should be the number of vehicles to have 118 wheels and 20 pairs of headlights?

- A. 5 Tanks, 7 Bulldozers, 6 Excavators
- B. 4 Tanks, 5 Bulldozers, 4 Excavators
- C. 7 Tanks, 5 Bulldozers, 8 Excavators
- D. 3 Tanks, 8 Bulldozers, 7 Excavators
- E. 6 Tanks, 4 Bulldozers, 6 Excavators

Q68. The bob of a pendulum of length l is pulled aside from its equilibrium position through an angle θ and then released. The bob will then pass through its equilibrium position with a speed v , where v equals to

- A. $\sqrt{2gl(1 - \cos\theta)}$
- B. $\sqrt{2gl(1 + \cos\theta)}$
- C. $\sqrt{2gl(1 - \sin\theta)}$
- D. $\sqrt{2gl(1 + \sin\theta)}$

Q70. 1,5,8,10,27,37,88,321,402 have median M . If 3 and 28 are added to the list, then the new median is N . Find $M-N$?

Q71. Let $A = \begin{bmatrix} 0 & -\tan \alpha/2 \\ \tan \alpha/2 & 0 \end{bmatrix}$ And let I be an identity matrix of order 2×2 , then which of the following options are true?

- A. $I + A = (I - A) \begin{bmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$
- B. $I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$
- C. $I = (I - A) \begin{bmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$
- D. $A = (I - A) \begin{bmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$

Q72. In a school match tournament, 38 medals were awarded in football, 20 in basketball, 15 in cricket. 3 students were awarded medals in all the three sports.

In total 58 medals were awarded. Find the number of people with medals in exactly 2 sports?

- A. 18
- B. 9
- C. 11
- D. 5
- E. None of these

Q73. Which of the following does not belong to the power set of $\{1,2,3,4\}$?

- A. $\{1,2,3\}$
- B. $\{1\}$
- C. $\{1,2,3\}$
- D. \emptyset
- E. None of these

Q74. If n is any positive integer belonging to the range $[5,100]$ then the cumulative sum of the number of roots of the equation $x^2 - 2x + n = 0$

- A. 14
- B. 12
- C. 7
- D. 6
- E. None of these

Q75. Consider the condensation of a gas particle on a surface, then which of the following is correct?

(Where $\Delta H = \text{Enthalpy change}$ and $\Delta S = \text{Entropy change}$)

- A. Occurs at $T < \frac{\Delta H}{\Delta S}$
- B. Occurs at $T > \frac{\Delta H}{\Delta S}$
- C. Occurs at $T > \frac{\Delta G}{\Delta S}$
- D. Occurs at $T < \frac{\Delta G}{\Delta S}$

Q76. A company manufactures 2000 items of type I, 4000 items of type II and 6000 items of type III. The probabilities of accidents during transport are 0.01, 0.03 and 0.15 respectively. Suppose an accident occurs. Find the probability that the accident has occurred on type I?

- A. $1/36$
- B. $1/52$
- C. $1/72$
- D. $\frac{1}{2}$
- E. None of these

Q77. Which of the following is diamagnetic in nature

- A. $[\text{Fe}(\text{CN})_6]^{3-}$
- B. $[\text{Fe}(\text{Cl})_4]^{2-}$
- C. $[\text{Fe}(\text{CN})_6]^{3-}$
- D. $[\text{Fe}(\text{Cl})_4]^{2-}$

Q78. Planet radius is 40 astronomical units. Earth is 1, Then the best value for period of the planet is:

- A. 180
- B. 450
- C. 300
- D. 250
- E. 80

Q79. Find intersection points of line $2x+y=3$ and ellipse $4x^2+y^2=5$.

- a) $(1/2, 2), (1, 1)$
- b) $(1/2, 2), (1, -1)$
- c) $(-1/2, 2), (1, 1)$
- d) $(-1/2, 2), (-1, -1)$

Q80. Body is initially moving with speed 1000 cm/s. If work done by a force is -36J. Find speed. ($m=2000\text{g}$)

Q81. Compute the determinant $\begin{vmatrix} 1 & 4.5 & 3 \\ 1.5 & 4 & 2 \\ 5 & 0 & 3.5 \end{vmatrix}$

Q82. Find alpha (Two Matrix were given, We got this much details from students only):

Q83. Find the mean deviation of median 3,9,5,3,12,10,18,4,7,19,21

Q84. $\lim_{x \rightarrow 1} \left(\frac{x^{10}-1}{x^5-1} \right)$

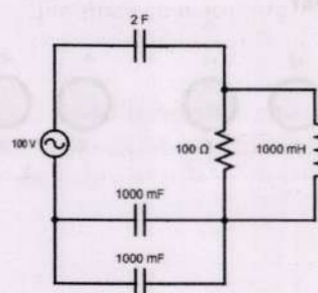
Q85. Assuming all planets follow kepler's laws. Planet P and Planet Q have ratio of their radius of the planet is " r " and ratio of their escape velocities is " v ". Find the ratio of their acceleration due to gravity.

- A. $\frac{v^2}{r}$
- B. $\frac{r}{v}$
- C. $\frac{v}{r}$
- D. $\frac{r^2}{v}$

Q86. $4x^3 - 6x^2 - 72x + 36 = 0$, is negative in?

- A. $(-3, 2)$
- B. $(-2, 3)$
- C. $(-\infty, -2)$
- D. $(3, \infty)$

Q87. AC circuit with angular frequency $=0.519$. Find charge on first 2f capacitor.



Q88. A charge is placed in a potential $V(x, y) = x^2 + y^2$. What can you say about its motion?

- A. Acceleration in a straight line.
- B. Retardation
- C. Circular Motion
- D. Rest
- E. None

Q89. Freezing point of a solution having 4 g solute in 100 g water is -1.4°C ($K_f = 1.86$). Find the solute.

- A. NaF
- B. KF
- C. RbF
- D. CsF
- E. LiF

Q90. Which of the following was lyophobic colloid?

- A. Clay
- B. Soil
- C. Blood
- D. Gold sol
- E. Both A and D

Q91. Which of the following is non combustible?

- A. Oxygen
- B. Sulphur
- C. CH_4
- D. NO

Q92. 5 different balls are given. Two balls are required to make a signal. How many such signals can be made

Q93. From the top of a cliff:

1. A ball was thrown upwards and by the time it reached the ground, its speed was U_a
2. A ball was thrown horizontally and it reached the ground with speed U_b
3. A ball was thrown down with the same speed as both cases and it reaches with speed U_c

Give the relation between?

- A. $U_a > U_b > U_c$
- B. $U_a < U_b < U_c$
- C. $U_a = U_b = U_c$
- D. $U_a = U_b > U_c$

Q94. A salt solution is poured in a container containing charcoal and a dye is added. After many days, a colourful garden is formed? What is the reason.

- A. The salt molecules go between the molecules of the charcoal and the water is evaporated, forming dyed crystals
- B. The dyed salt solution between the charcoal looks like that
- C. The salt solution reacts with the molecules to form complex compounds