

General Instructions :

1. This paper is divided into three sections : A,B and C. All the sections are compulsory.
2. Separate instructions are given with each section and question, wherever necessary. Read these instructions and follow them carefully.
3. Do not exceed the prescribed word limit while answering the questions.

① Eng
② Phy
③ Maths
④ C.S
⑤ Chem
⑥ G.K

SECTION A (READING)

30 Marks

1. Read the passage given below and answer the questions that follow :

1×12=12

1. The newest stress buster is paper yoga. Adults are now changing over from their smart phones to colouring books to beat anxiety and relax. They spend hours hunched over the drawing of mandalas filling in their words into the circle, with colours. These adult colouring books are classified in the adult category and are becoming fast selling items as people reach out to them to relax their minds. And it is not just mandala drawings that are in vogue. Others settle for elaborate landscapes, cultural tableaux, brimming with images of dancers, singers and concerts. Involutes of various shapes also make up this list.
2. Just as the demand has kept growing, there are also authors who are much in demand for their relaxing creations. Leading in this field is Johanna Basford ,who has sold 1.4 million copies of her books” Secret Garden” ,”Enchanted Forest” and “Lost Ocean”,in a matter of just two years. More bookstores have now started stocking such books as customers are asking for them. Publishers now contend that it is not just celebrity authors in this category but any book with the tag –line ‘de-stress’ has a readymade market for it.
3. Another reason for the success of these books is that they are multilingual in the way that they speak to adults of all age groups cultures and dispositions. Even nursery teachers are fast becoming customers of these books not because they are overworked but because of the fun that even five year olds are having with their own colouring books.
4. The new trend has been dubbed ‘Paper Yoga’. While the junior versions of these books hold simple generously proportioned patterns, that allow for a child’s broad strokes, the adult variants typically have tight kaleidoscopes that require a fine pen and a staunch eye. As they do not require special skills to execute, publishers are marketing it with the tag-line that their target customer is anyone who can draw satisfaction from something beautiful. The skills of drawing and colouring or conceptualization, essentials for the art of drawing, are not in this list of requirements. Thus the phobia of being an expert or amateur is not a deterrent.
5. So far, publishers have had to import their stock as there are not sufficient titles available. But illustrators are fast catching up with this trend and some have even ventured into self – publishing in this line. Others are innovating still more meaningful inputs into this work by asking customers to bring their own experiences to the book.
6. Individual stories of success are making an appearance too. Illustrator Indu Harikumar started her self – published colouring book, ‘Beauty Needs Space’, on social media. She priced a copy of 12 artworks as ₹ 1500 and sold 155 of the 200 she had printed. ‘People have written to say that they connected with the book as they worked on it.’
7. While adults are discovering their inner selves through this creative pursuit, art – based therapeutics warn against expecting too much from these books for saving lives or minds. At best, they calm the mind and are a temporary diversion, for the mind and cut off the noise of clamouring thoughts. These books they claim can offer therapeutic returns only when used in conjunction with a therapist’s counsel. As yet the entire process is undergoing a testing time but whatever little of it has emerged, is being hailed as a step in the positive direction.

1.1 On the basis of your understanding of the above passage, answer the following questions with the help of the given options :

- (a) Adult spend hours over their mandalas
- (i) colouring them
 - (ii) filling in the words into them
 - (iii) filling in messages into them
 - (iv) writing their life history in them



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6. 1r
- (b) Joanna Basford's colouring books are called
- (i) Basford Gardens, Secret gardens
 - (ii) Paper Yoga, Beauty Needs Space
 - (iii) Enchanted Forest, Paper Boats
 - (iv) Secret Garden, Enchanted Forest, Lost Ocean
- (c) Indu Harikumar started her colouring book
- (i) On the social media
 - (ii) in public spaces
 - (iii) in school classrooms
 - (iv) in international meets
- (d) Colouring books can serve best if combined with
- (i) a temporary diversion of the mind
 - (ii) working on social media
 - (iii) a therapist's counsel
 - (iv) a counsellor's advice

1.2 Answer the following questions briefly:

- a) What is the newest stress buster and what does it use?
- b) What topics distinguish adult colouring books?
- c) Why are the publishers forced to import stock?
- d) What is the latest trend in this line?
- e) Who is the leading author in this field?
- f) Trace the growth of Indu Harikumar in this line.

1.3 Find words from the passage which mean the same as :

- (a) very complicated and detailed (para 1)
- (b) A thing that discourages someone from doing something (para 4)

2. Read the following passage carefully

1×10=10

1. Almost 3000 years of food evolution has taken place for the pizza pie to reach its current delicious state today. Although flat breads have been around for 6000 years , the word "pizziare" started appearing in Italian writings as far back as 1000 B.C. The word 'pizza' itself is believed to have originated from an old Italian word meaning "a point" ,which in turn became the Italian word "pizziare", which means to pinch or to pluck.
2. Tomatoes were first introduced to Italy from South America in 1522.At first the tomato was believed to be poisonous. Fortunately, the poorer peasants of the region finally overcame their doubts about tomatoes in the 17th century and began adding it to the bread dough, and the first pizzas were created.
3. Before the tomatoes arrived in the 1500s , the first pizzas in Naples were white, made with garlic ,olive oil. salt, anchovies and probably, lard. Neapolitans were the first in Europe to embrace the tomato, since it was deemed poisonous in Europe as a member of the nightshade family. With the rise in popularity of tomato, people started using it more and more. Mozzarella cheese was also slowly gaining ground. Mozzarella had become available in Italy only after water buffaloes were imported from India in the 7th century (Mozzarella was first made with water buffalo milk).Its popularity grew very slowly until the last half of the 18th century. In fact, cheese and tomatoes did not meet on a pizza until 1889.
4. What is most commonly considered Pizza(tomato, mozzarella ,basil) was supposedly created on June 11,1889 by a pizza maker named Raffaele Esposito. This pizzaiolo (pizza maker) created a special pizza for the visit of Queen Margherita of Savoia. He made three different pizzas but the queen fell in love with one , in particular ,topped with three ingredients representing the three colours of the Italian flag. The Italian flag was represented by tomatoes(red),mozzarella (white) and basil(green).Esposito named the pizza "Pizza alla Margherita" in honour of the queen.
Whether Esposito was the first to use those ingredients or not .this is known as the classic Neapolitan pizza or the modern day tomato and cheese pizza.
5. In the latter half of the 19th century, pizza migrated to America with the Italians. By the turn of the century, the Italian immigrants had begun to open their own bakeries and were selling groceries as well as pizza. Gennaro Lombardi opened the first true US pizzeria in 1905 at 531/3, Spring street in New York city, a part of the town known as "Little Italy."

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6. In India, of late ,pizza has become a popular food. It has become a fashion and also a manner of showing that one is part of the famous Western culture. In fact, it is more of a fashion statement. The popularity of the food is rocketing. This is evident from a report by Fortune , a magazine. The two giants of the pizza industry, Pizza Hut and Dominos , are in hot competition with each other in India. India has 134 Pizza Huts and 149 Dominos locations, with each chain opening 50 stores a year.
7. The popularity of pizza in India, Fortune claims, is because of its similarity to India's native cuisine. Unlike Chinese and Japanese, Indians eat leavened bread (roti/naan) and a popular traditional version slathers it in butter and garlic-not unlike garlic bread, the most often ordered side dish at both Dominos and Pizza Hut franchises in India. Cheese(paneer) is ubiquitous in India's northern cuisine. Tomatoes and all kinds of sauces are prevalent everywhere. Combine these ingredients into one gooey, oily, tasty dish that you can eat with your hands-as Indians traditionally do and you have a hit. Compare this with another popular food, noodles. Sometimes it slurps down our forks and off the plate, and here we land up in a whole lot of mess. Added to this, is the embarrassment it would have caused, had the place been a famous restaurant or the boss's party. The one thing that increases the love for pizza among one and all is that we can all eat it with our hands.
8. Experts estimate that the Indian Pizza market will grow at a compound annual rate of 15 percent. As per estimates of the Ministry of food processing, the ready-to -eat market in India today exceeds rupees 40 billion (US \$ 800 million),with the size of the heat-and -eat pizza market being Rupees 2.5 billion(US \$ 50 million).Most of those sales will come in large metropolises and mini-metros like Pune, Ahmedabad, Hyderabad and Bangalore.

2.1 On the basis of your understanding of the passage, answer the following questions with the help of the given options.

- (i) What does the word 'pizza 'mean?
 - a. to pinch b. to cut c. to slice d. to encircle
- (ii) Which pizza represented the Italian flag?
 - a. Tomato and mozzarella b. Mozzarella and basil
 - c. Mozzarella, tomato and basil d. Mozzarella, tomato and spinach

2.2 Answer the following questions briefly.

- (i) Why was Mozzarella not used initially in pizzas? When was it first used?
- (ii) Why did Raffaele make a special pizza? How many pizzas did he make?
- (iii) When did pizza migrate to America?
- (iv) According to 'Fortune' ,why is pizza becoming popular in India?
- (v) According to the author, how does pizza differ from noodles?
- (vi) How much does the heat -and -eat pizza represent the ready -to -eat market in India?

2.3 Find the words from the passage which mean the same as the following.

- (a) found everywhere (para 7) (b) spread liberally (para 7)

3. Read passage given below :

You wouldn't think it to look at them, but your salt and pepper shakers have caused a lot of problems over the years. Underneath the harmless ceramic bulb lies a history of kingdoms torn apart, newly discovered worlds and powerful trade dynasties. The story of spices fills many a book, but we are going to take an abridged look at salt here.

Salt doesn't just make your food tastier _it's actually required for life. Sodium ions help the body perform a number of basic tasks, including maintaining fluids in the blood cells and helping the small intestine absorb nutrients. We cannot make salt in our own bodies, so humans have always had to look into their environment to fulfill their needs. Early hunters could get a steady supply of salt from meat, but agricultural groups had to seek it out by following animal tracks to salt deposits.

The Egyptians were the first to realize the preservation possibilities of salt. Sodium draws the bacteria-causing moisture out of foods, drying them and making it possible to store meat without refrigeration for extended periods of time. Delicacies like our modern day parma hams, gravlax, bresaola and baccala are all the result of salt curing. But back in the day,this type of preservation was not limited to meat. Mummies were packed in salt too. In fact, when mummies were shifted down the Nileas cargo, they were taxed in the "salted meat" bracket.

How did ancient populations get their salt? The Shangxi province of China has a salt lake, yuncheng, and it is estimated that wars were being fought over control of its salt reserves as early as 6000 B.C. Salt was gathered from the lake during the dry season, when the water evaporated and flats of salt were exposed. The Egyptians got their salt from Nile marshes, while early British towns clustered around salt springs. In fact the suffix "wich" in English place names like Middlewich and Norwich is associated with areas where salt working was a common practice.

Even well into the American history, destinies were decided by salt. One example is India's Salt satyagraha. During the Civil War, salt was a precious commodity, used not only for eating but also for tanning leather, dyeing clothes and preserving troop rations. Confederate President Jefferson Davis even offered a military service waiver to anyone willing to work on salt production on the coast. The ocean was the only reliable source of salt for the South since inland production facilities were so valued that they became early targets of Union attacks. Consider this rich history next time you season your food.

(A) On the basis of your reading of the above passage make notes on it, using headings and sub-headings.

Use recognizable abbreviations (wherever necessary-minimum four) and a format you consider suitable. Also supply an appropriate title to it.

(5)

(B) Write a summary of the passage in about 80 words.

(3)

SECTION B (ADVANCED WRITING SKILLS)

30 Marks

4. You are Rani/Raja . You have got a seat in IIT Kharagpur as you have scored a very good rank in JEE. You have decided to host a party for your close friends and relatives before you leave for Kharagpur. As Rani/Raja draft an informal invitation in not more than 50 words.

(4)

OR

You are Koshika Khanna, the Cultural Secretary of Wellington Public School, Ooty. Write a notice for your school Notice Board informing students to participate in the programme on the FM Radio. Invite talented students to appear for trial for different items and Radio Jockey for special programme for children (word limit – 50).

5. You are P.L. Sharma, residing in No.12, Abu Bakr Road, Dubai. You want your daughter Navita, at present studying in Class VIII, Indian school, Dubai to be admitted in A.J. Public School Ajmer, next year, in class IX. As P.L. Sharma, write a letter to the Principal of Akash Public school, Ajmer enquiring of him the procedure for admission, fees and also asking for a prospectus. Your letter should be written within 150 words.

(6)

OR

You are Kamla/Kamal. Recently you travelled from Durg to Bangalore by train. To your dismay, you found that the coach you travelled in was infested with cockroaches and rodents. You realized that such an unhygienic condition was due to the careless attitude of the employees of the railway services and also the lack of co-operation of the public in maintaining the cleanliness of the coaches. Write a letter to the editor of The Times, Raipur, expressing your views on the same. Also, suggest some measures to deal with this problem. Your letter should be written in about 120 words.

6. Social networking sites and various mobile applications are making a slave of humans. People, these days, are addicted to them and have hardly any time for the social interaction. Write a speech to be delivered in the morning assembly, expressing your views on the impact of the various social networking sites and mobile applications on real human interaction. You are Leena / Leroy.

(word limit -150-200)

(10)

OR

You are Sweta/Sharat. You have to speak in a debate competition organized by your school .The topic for the debate is "Peer pressure helps students in performing better at school." Write the debate for Shweta/Sharat supporting or opposing the motion in about 150-200 words.

7. Arti/Anuj has been involved as a student volunteer in the ' Literacy Drive' and has been working in the slums for the last six months. She/he sees the pathetic condition of the slum dwellers from close quarters and so decides to write an article for the school magazine motivating the students to work for the poor and the downtrodden so that they also have a happy life like others. Write the article in about 150-200 words.

(10)

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OR

The number of cars that a country produces every year is one way of measuring its prosperity. At the same time, what the vehicles lead to are traffic jams, air pollution, road rage and an unhealthy competition among people. Write your views, in the form of an article of about 150-200 words, highlighting the demerits of private vehicles and the merits of public transport. You are Veena/Vignesh.

Section C - Literature and Long Reading Text

8. Read the extracts given below carefully and answer the questions that follow.

(1×4=4)

“-----At back of the dim class
One unnoted, sweet and young. His eyes live in a dream,
Of squirrel's game, in tree room, other than this.”

1. Name the poem and the poet.
2. What is the sweet boy engaged in?
3. What is the significance of the phrase 'other than this'?
4. Who were the other students in that class? (Mention any two)

OR

“It would be an exotic moment
without rush, without engines
We would all be together
In a sudden strangeness.”

1. Name the poem and the poet.
2. What would be an 'exotic' moment?
3. In what way can that be an exotic moment?
4. Name the poetic device in the fourth line.

9. Answer any four of the following in 30-40 words each.

(3×4=12)

- a. Describe the mother in 'My Mother at sixty six'.
- b. What are M. Hamel's views about learning one's native language?
- c. How did the crofter treat the peddler?
- d. Do you think the poet advocates total inactivity? Give reason.
- e. Why does Hana wash the wounded man herself?
- f. Why did the rat trap peddler sign as Captain Von Stahle?

10. Answer the following question in 120-150 words.

(6)

The grinding poverty and traditions obstruct the development of many children of India. Explain the statement with reference to the lives of Saheb and Mukesh (Lost spring).

OR

Describe the misadventure in the life of William Douglas. What change did it bring about in his life?

11. Answer the following question in 120-150 words.

(6)

How did Dr. Sadao help in the escape of the American prisoner of war?

OR

Describe the efforts made by the Tiger king to achieve the target of killing a hundred tigers.

12. Answer the following question in 120-150 words.

(6)

Describe the circumstances that led to the unveiling of the identity of the Invisible Man.

13. Answer the following question in 120-150 words.

(6)

Attempt a character sketch of Mrs. Hall.

DELHI PUBLIC SCHOOL, BHILAI (C.G.)

DATE : 12-09-2016

FIRST TERM EXAMINATION, 2016

Time : 3 Hours

CLASS : XII

PHYSICS

M.M : 70

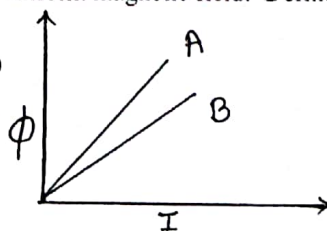
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General Instructions -

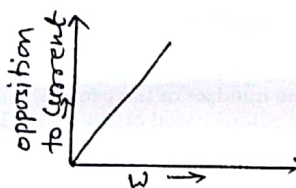
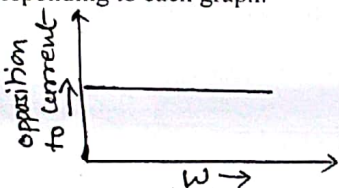
- i) There are 26 questions in all. All questions are compulsory.
- ii) The question paper has five sections.
- iii) Section A contains five questions of one mark each. Section B contains five questions of two marks each, section C contains twelve questions of three marks each. Section D has a value based question of four marks and section E contains three questions of five marks each.
- iv) There is no overall choice. However an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks.
- v) You may use the following values of physical constants wherever necessary.
 $\mu_0 = 4\pi \times 10^{-7} TmA^{-1}$ radius of earth $r = 6.4 \times 10^6$ m.

SECTION A

- 1) Is electrostatic potential necessarily zero at a point where electric field strength is zero? Give an example to illustrate your answer 1
- 2) A charged particle moves through a region of uniform magnetic field. Define one Tesla on the basis of force acting on it. 1
- 3) A plot of magnetic flux (Φ) versus current (I) is shown in figure for two inductors A and B which of the two has larger value of self inductance. 1



- 4) The graph shown in fig(a) and fig(b) represents the variation of opposition offered by the circuit element to the flow of AC with the frequency of applied emf. Identify the circuit element corresponding to each graph. 1



- 5) The charging current for capacitor is 0.25 A. What is displacement current? 1

SECTION B

- 6) A 600 pF capacitor is charged by a 200 V supply. It is then disconnected from the supply and connected to another uncharged 600 pF capacitor. How much energy is lost in the process? 2
- 7) What is an ideal electric dipole? What happens to net force and torque acting on a dipole when it is placed in a non-uniform electric field? 2
- 8) The potential difference V is applied to a conductor of length L, diameter D. How are the electric field E and drift velocity V_d affected a) V is doubled b) L is doubled. Explain your answer. 2
- 9) State Biot-Savart's law and write its vector form. 2
- 10) A plane electromagnetic wave travels in vacuum along the Y direction write
 - i) The direction of its electric and magnetic field vectors and 2
 - ii) The ratio of the magnitudes of electric field and magnetic field. 2

(OR)

What is meant by the transverse nature of EM waves? Draw a diagram showing the propagation of an electromagnetic wave along the X-direction, indicating clearly the directions of oscillating electric and magnetic fields associated with it.

SECTION C

- 11) a) What is electrostatic induction? 3
 b) Describe how two metal spheres can be oppositely charged by induction. 3
- 12) Define : a) Dielectric b) Dielectric constant c) Dielectric strength 3
- 13) Derive the formula for total power consumed when electrical appliances are connected with DC source in a) series b) parallel. 3
- 14) A 10 m long wire of uniform cross section of 20Ω resistance is used as a potentiometer wire. This wire is connected in series with a battery of 5V along with an external resistance of 480Ω . If an unknown emf E is balanced at 600 cm of this wire. Calculate the i) potential gradient of the potentiometer wire and ii) value of emf E. 3
- 15) a) State the Wheatstone bridge principle. 3
 b) Obtain the condition for balanced Wheatstone bridge. 3
- 16) Write principle of cyclotron and show that magnetic resonance frequency of cyclotron does not depend upon speed of charged particle. 3

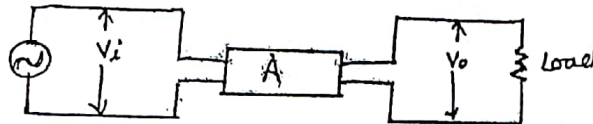
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- ... 2 ...
- 17) With the help of figure. Show mathematically that deflection produced in the galvanometer coil is proportional to current flowing through it.
- 18) Two concentric circular coils X and Y of radii 16 cm and 10 cm respectively lie in the same vertical plane containing the north south direction coil X has 20 turns and carries a current of 16 A ; coil Y has 25 turn and carries a current of 18A. The sense of current in X is anticlockwise and in Y clockwise for an observer looking at the coil facing west, give the magnitude and direction of net magnetic field due to the coils at their centre.

(OR)

The earth's field, it is claimed roughly approximates the field due to a dipole of magnetic moment 8×10^{22} J/T located at its centre. Check the order of magnitude of this number in some way.

- 19) An aircraft with a wingspan of 40 m flies with speed of 1080 km/hr in eastward direction at a constant altitude in northern hemisphere. Where the vertical component of earth's field is 1.75×10^{-5} T. Find the emf that develops between the tips of wings.
- 20) What are eddy currents? Write two applications of eddy currents. How are eddy currents minimized?
- 21) a) What is working principle of transformer?
 b) Why is the core of transformer made of magnetic material of high permeability?
 c) Identify the device 'A' given $V_i > V_o$



- 22) How are infrared waves produced? Why are these referred to as "Heat Waves" write their one important use.

SECTION D

- 23) Manish and Rajnish lived in an unauthorized colony. They found that most of the people of that colony stole power from transmission lines using hooks. They had read in the news paper about different fire accidents caused due to electric short circuits. Along with some of their friends and some responsible representatives of the area, they visited house to house of that colony and made people aware of the risks involved in short circuiting. They also explained the people the importance of paying electric bills. They succeeded in changing the mindset of the people.

Answer the following questions based on the above information :

- a) What according to you are the values displayed by Manish and Rajnish.
 b) A household circuit has a fuse of 5 A rating. Find the maximum number of bulbs of rating 60W – 220 V each which can be connected in this circuit.

SECTION E

- 24) a) Using Gauss' law deduce the expression for the electric field due to uniformly charged spherical conducting shell of radius R at a point i) outside ii) inside the shell. 3+1+1
 b) Plot a graph showing variation of \vec{E} as a function of $r > R$ and $r < R$ (r being distance from centre of shell).
 c) Two charges of magnitude ' $-3q$ ' and ' $+2q$ ' are located at points $(a,0)$ and $(4a,0)$. What is the electric flux due to these charges through a spherical shell of radius $5a$ with its centre at the origin.

(OR)

- a) Derive expression for electric potential at any general point at distance ' r ' from the centre of electric dipole.
 b) Sketch equipotential surface for electric dipole.
 c) Two charges ' $-q$ ' and ' $+q$ ' are located at points $(0,0, -a)$ and $(0,0, a)$ respectively. How much work is done in moving a small test charge from the point $(5,0,0)$ to $(-7,0,0)$ along the X-axis.
- 25) a) Using phasor diagram derive expression for the impedance of a LCR series circuit. 3+2
 b) A series LCR circuit connected to a variable frequency 230V source $L = 5.0$ H, $C = 80 \mu\text{F}$, $R = 40 \Omega$. Determine the source frequency which drives the circuit in resonance.

(OR)

- a) Derive expression for mutual inductance of two long coaxial solenoids of same length wound over the other.
 b) A solenoid of length 50 cm with 20 turns per cm and area of cross section 40 cm^2 completely surrounds another coaxial solenoid of same length area of 25 cm^2 with 25 turns per cm. Calculate coefficient of mutual inductance.

- 26) a) How diamagnetic, paramagnetic and ferromagnetic samples will behave ?

- i in external non-uniform magnetic field.
 ii after removal of external magnetizing field .
 iii when temperature is increased.

- b) If a toroid was Bismuth for its core. Will the field in the core be slightly greater or less than when the core is empty? Give reason to your answer.

(OR)

- a) Derive an expression for magnetic dipole moment of an electron revolving around a nucleus.
 b) Define Bohr magneton and write its value.

General Instructions :

- (i) All questions are compulsory.
- (ii) This question paper contains 29 questions.
- (iii) Question 1-4 in Section A are very short-answer type questions carrying 1 mark each.
- (iv) Question 5-12 in Section B are short-answer type questions carrying 2 marks each.
- (v) Question 13-23 in Section C are long-answer-I type questions carrying 4 marks each.
- (vi) Question 24-29 in Section D are long-answer-II type questions carrying 6 marks each.

Section-A

1. What is the principal value of $\cos^{-1}(\cos \frac{2\pi}{3}) + \sin^{-1}(\sin \frac{2\pi}{3})$?
2. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is given by $f(x) = (3 - x^3)^{\frac{1}{3}}$, then find $f(f(x))$.
3. Consider the binary operation on \mathbb{Q} defined by $a * b = a + 12b + ab$ for every $a, b \in \mathbb{Q}$.
Find $2 * \frac{1}{3}$
4. For the curve $y = 5x - 2x^3$, if x increases at 2 units/sec then how fast is the slope of the curve changing when $x = 3$

Section-B

5. If $y = (\log x)^x \cdot x^{\log x}$ then find $\frac{dy}{dx}$.
6. If $x = a(\theta - \sin \theta)$, $y = a(1 + \cos \theta)$ find $\frac{dy}{dx}$.
7. Find a matrix A satisfying the matrix equation $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.
8. Evaluate : $\int \frac{\tan^4 \sqrt{x} \sec^2 \sqrt{x}}{\sqrt{x}} dx$.
9. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$
10. Find the approximate value of $\sqrt{0.0035}$, using differentiation.
11. Find the points on the curve $x^2 + y^2 - 2x - 3 = 0$ at which the tangents are parallel to X - axis.
12. Verify mean value theorem for the function $f(x) = \sin x + \cos x$ in $[0, 2\pi]$.

Section-C

13. If $y = (\cot^{-1} x)^2$, then show that $(x^2 + 1)^2 \frac{d^2 y}{dx^2} + 2x(x^2 + 1) \frac{dy}{dx} = 2$.
14. Sand is pouring from a pipe at the rate of $12 \text{ cm}^3/\text{s}$. The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4 cm.
15. Evaluate : $\int \frac{3x+5}{4x^2+5x-7} dx$.
16. Evaluate : $\int_1^4 (|x-1| + |x-2| + |x-3|) dx$.

(OR)

Evaluate : $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{dx}{e^{\sin x} + 1}$

17. Show that $y = \log(1+x) - \frac{2x}{2+x}$, $x > -1$, is an increasing function of x throughout its domain
18. Prove that $\cot^{-1} \left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right) = \frac{x}{2}$, $x \in (0, \frac{\pi}{4})$

(OR)

Prove that : $2 \sin^{-1} \frac{3}{5} - \tan^{-1} \frac{17}{31} = \frac{\pi}{4}$

19. Show that the relation R defined by $(a,b) R (c,d) \Rightarrow a+d = b+c$ on $A \times A$, where $A = \{1,2,3,\dots,10\}$ is an equivalence relation.

20. Show that the function $f(x)$ defined as $f(x) = \begin{cases} \frac{e^x-1}{e^x+1} & \text{if } x \neq 0 \\ -1 & \text{if } x = 0 \end{cases}$ is discontinuous at $x = 0$.

21. If $\cos y = x \cos(a+y)$, with $\cos a \neq \pm 1$, prove that $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$

22. Using properties of determinants, prove that $\begin{vmatrix} a & b-c & c+b \\ a+c & b & c-a \\ a-b & b+a & c \end{vmatrix} = (a+b+c)(a^2+b^2+c^2)$
(OR)

Using properties of determinants, prove that

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$$

23. Using elementary transformations find the inverse of the matrix $\begin{bmatrix} 2 & -2 & 0 \\ 1 & 2 & -2 \\ 0 & -1 & 4 \end{bmatrix}$

Section-D

24. Two schools A and B decided to award prizes to their students for three values honesty(x), punctuality(y) and obedience(z). School A decided to award a total of ₹ 11000 for the three values to 5,4 and 3 students respectively while school B decided to award ₹ 10700 for the three values to 4,3 and 5 students respectively. If all the three prizes together amount to ₹ 2700, then (i) represent the above situation by a matrix equation and form linear equations using matrix multiplication. (ii) Solve using matrix method. (iii) which value you prefer to be rewarded most and why?

25.(i) Solve for x : $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$.

(ii) Express $\begin{bmatrix} 5 & 4 & -2 \\ 3 & -4 & 6 \\ 0 & -2 & 3 \end{bmatrix}$ as a sum of a symmetric and a skew – symmetric matrices.

26. Show that the height of the cylinder of greatest volume which can be inscribed in a right Circular cone of height h and semi vertical angle α is one-third of that of the cone and the Greatest volume of cylinder is $\frac{4}{27} \pi h^3 \tan^2 \alpha$.

(OR)

A window is in the form of a rectangle surmounted by a semi-circle. The total perimeter of the window is 10m. Find the dimensions of the window to admit maximum light through the whole opening.

27. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx$ (OR)

Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\cos x dx}{1 + \cos x + \sin x}$

28. (i) Consider $f: \mathbb{R}_+ \rightarrow [-9, \infty)$ given by $f(x) = 5x^2 + 6x - 9$. Show that f is invertible with

$$f^{-1}(y) = \left[\frac{\sqrt{5y+54}-3}{5} \right]$$

(ii) Let * be a binary operation on Q_0 (set of all non-zero rational numbers) defined by $a*b = \frac{ab}{4}$, for every a,b $\in Q_0$. Then find the identity element in Q_0 .

29. (i) Evaluate : $\int_0^1 (x^2 + 3) dx$ as a limit of a sum.

(ii) Evaluate : $\int e^x \left(\frac{1+\sin x}{1+\cos x} \right) dx$

(OR)

(i) Evaluate: $\int_a^b e^x dx$ as a limit of a sum.

(ii) Evaluate : $\int_0^{\frac{\pi}{4}} \log(1 + \tan x) dx$.

General Instructions :

- i) All the questions are compulsory.
 ii) Programming Language : Python.

1. a) Out of the following, find those identifiers, which cannot be used for naming variables or functions in Python's program : (2)
Total#Tax, for, Class, switch, 3rdrow, finally, row25
- b) Differentiate between static binding and dynamic binding. (2)
- c) What do you understand by Data Encapsulation and Data hiding? Also, give an example in Python to illustrate both. (2)
- d) Name the Python library modules which need to be imported to invoke the following functions. (2)
 (i) round() (ii) load() (iii) now() (iv) search()
- e) Rewrite the following code after removing all syntax error(s). Underline each correction. (2)
- ```
S1, S2 =0
for x in range (0,11):
 num = int(("Enter the number"))
 (num>0)
 S1=S1+num
else:
 S2=S2/num
print("%d%d"%(S1,S2))
```
- f) Find and write the output of the following Python code: (2)
- ```
b=[4,6,7,4,5,12,11,10,8,17]
for i in range (1,3):
    for j in range(1,3):
        b[i]=4*i+j
    print(b[i])
```
- g) How many times are the following loop extended? (2)
- (i) for a in range (100,10, -10):
 print(a)
- (ii) i=100
 while(i<=200):
 print(i)
 i+=20
- (iii) i=4
 while(i>=4):
 print(i)
 i+=10
- (iv) i=2
 while(i<=25):
 print(i)
- h) What will be the output of the following code? (3)
- ```
class Contact:
 all_contact = []
 def __init__(self, name, email):
 em=[]
 em.append(name)
 em.append(email)
 Contact.all_contact.append(em)
 print(Contact.all_contact)
 print(self.all_contact)
MyID=Contact("Amit Kulkarni", "Amit2008@gmail.com")
```



i) Which string method is used to implement the following :

- (i) To count the number of characters in string.
- (ii) To change the first character of the string in capital letter.
- (iii) To check whether given character is a letter or a number.
- (iv) To change lower case to upper case.

j) What are the possible outcome(s) executed from the following code?

Also specify the maximum and minimum values that can be assigned to variable COUNT.

```
TEXT="CBSEONLINE"
```

```
COUNT=random.randint(0,3)
```

```
c=9
```

```
while TEXT[c]!='L':
```

```
 print TEXT[c]+TEXT[COUNT]+'*',
```

```
 COUNT=COUNT+1
```

```
 C=C-1
```

- |           |           |           |           |
|-----------|-----------|-----------|-----------|
| (i)       | (ii)      | (iii)     | (iv)      |
| EC*NB*IS* | NS*IE*LO* | ES*NE*IO* | LE*NO*ON* |

2. a) How is `__init__()` different from `__del__()` (2)

b) Differentiate between Static and Dynamic binding with example. (2)

c) State the benefits of static method in Python class. (2)

d) Name the method that can be used to : (2)

i) access attribute of an object

ii) delete an attribute of an object

iii) check whether the attribute str exists in the class Test whose object in T1.

iv) Assign a value "Hello" to the attribute str of Class Test and object T1.

e) Define a class CABS in Python with the following specification

Instance attributes :

- CNo - To store cab number
- Type - To store a character 'A', 'B' or 'C' as city Type
- PKM - To store per kilo meter charges
- Dist - To store distance travelled in (K.M)

Class Methods :

- A constructor function to initialize CNo as !11!, Type as 'A', PKM and Dist as 0 (zero).
- A function charges () is to assign PKM as per the following table:

| Type | PKM |
|------|-----|
| A    | 25  |
| B    | 20  |
| C    | 15  |

- A function Register() is allow to enter the values of CNo and Type. Also call charges() to assign PKM charges.
- A function ShowCabs() is allow user to enter value of distance travelled Dist and display CNo, Type, PKM and PKM\*Dist (as Amount) on screen.

3. a) Illustrate the concept of Inheritance with the help of a Python code. (2)

b) Explain the significance of super() function with example. (2)

c) Rewrite the following code after removing errors. Underline each correction and write the output after correcting the code : (3)

```
class First() :
```

```
 def __init__(self):
```

```
 print("first"):
```



```
class Second(object) :
 def __init__(self):
 print("second")
class Third(First, Second) :
 def __init__(self):
 First.__init__(self):
 Second.__init__(self)
 print("that's it")
t=Third()
```

d) What will be the output of the following program coded (2)

```
class A :
 x1=x2=0
 def __init__(self):
 print("Base Class A")
 self.x1=8
 self.x2=7
class B(A) :
 y=0
 def __init__(self):
 A.__init__(self)
 print("Derived Class B")
obj=B()
```

4. a) Explain the use of output functions write() and writelines() with an example. (2)
- b) Write appropriate python statement to do the following : (1)
- (i) To open a file name "EMP.DAT" for read and write together.
- (ii) To go to the 20<sup>th</sup> byte in a file.
- c) Write a method in python to read the content from a text file story.txt line by line and display the same on screen. (2)
- d) Write a function to count the words "this" and "these" present in a text file "ARTICLE.TXT". (2)
- e) Consider the following definition of class Student. Write a method in Python to write the content in a pickled file 'student.dat' (3)

```
class Student :
 def __init__(self, A, N) :
 self.Admno = A
 self.Name = N
 def show(self) :
 print (self.Admno, '#', self.Name)
```

- f) Write a program to print Fibonacci series by using generator. (3)
5. a) What do you understand by the term candidate key and cardinality of a relation in a relational database? (2)
- b) What are composite keys and primary key in a table? Give a suitable example to explain it. (2)
- c) What is the difference between CREATE VIEW and CREATE TABLE commands? (2)
- d) What are DDL and DML commands? Give example. (1)
- e) Consider the following DEPT and EMPLOYEE tables. Write SQL queries for (i) to (iv) and find outputs for SQL queries (V) to (VIII). (8)



**TABLE : DEPT**

| DCODE | DEPARTMENT     | LOCATION |
|-------|----------------|----------|
| D01   | INFRASTRUCTURE | DELHI    |
| D02   | MARKETING      | DELHI    |
| D03   | MEDIA          | MUMBAI   |
| D04   | FINANCE        | KOLKATA  |
| D05   | HUMAN RESOURCE | MUMBAI   |

**TABLE : EMPLOYEE**

| ENO  | NAME         | DOJ        | DOB        | GENDER | DCODE |
|------|--------------|------------|------------|--------|-------|
| 1001 | George K     | 2013-09-02 | 1991-09-01 | MALE   | D01   |
| 1002 | Ryma Sen     | 2012-12-11 | 1990-12-15 | FEMALE | D03   |
| 1003 | Mohitesh     | 2013-02-03 | 1987-09-04 | MALE   | D05   |
| 1007 | Anil Jha     | 2014-01-17 | 1984-10-19 | MALE   | D04   |
| 1004 | Manila Sahai | 2012-12-09 | 1986-11-14 | FEMALE | D01   |
| 1005 | R Sahai      | 2013-11-18 | 1987-03-31 | MALE   | D02   |
| 1006 | Jaya Priya   | 2014-06-09 | 1985-06-23 | FEMALE | D05   |

- i) To display ENO, NAME, GENDER from the table EMPLOYEE in ascending order of ENO.
- ii) To display the name of all the MALE employees from the table EMPLOYEE.
- iii) To display the ENO and NAME of those employees from the table EMPLOYEE who are born between '1987-01-01' and '1991-12-01'.
- iv) To count and display FEMALE employees who have joined after '1986-01-01'
- v) SELECT COUNT(\*), DCODE FROM EMPLOYEE  
GROUP BY DCODE HAVING COUNT(\*)>1;
- vi) SELECT DISTINCT DEPARTMENT FROM DEPT;
- vii) SELECT NAME, DEPARTMENT FROM EMPLOYEE E,  
DEPT D WHERE E.DCODE=D.DCODE and ENO<1003,
- viii) SELECT MAX(DOJ), MIN(DOB) FROM EMPLOYEE;



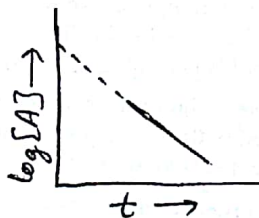
**General Instructions :**

- ❖ All questions are compulsory.
- ❖ Q.nos. 1 to 5 carry one mark each.
- ❖ Q.nos. 6 to 10 carry two marks each.
- ❖ Q.nos. 11 to 22 carry three marks each.
- ❖ Q.nos. 23 carries four marks.
- ❖ Q.nos. 24 to 26 carry five marks.

1. What do you mean by activity of a catalyst? 1
2. Write the structure of an isomer of compound  $C_4H_9Br$  which is most reactive towards  $SN_1$  reaction. 1
3. Name the non-stoichiometric point defect responsible for colour in alkali metal halides. 1
4. What do you mean by Williamson's synthesis? 1
5. Classify each of the following being either a p-type or n-type semi conductor. 1
  - (a) Ge doped with In
  - (b) Si doped with B
6. Copper crystallises into FCC lattice with edge length of  $3.61 \times 10^{-8}$  cm. Calculate the density of copper. Given, atomic mass of Cu = 63.5. 2
7. State Rate law. In a reaction if the concentration of the reactant R is quadrupled, the rate of reaction becomes 64 times. Calculate the order of the reaction. 2
8. Draw the graph showing the variation of the extent of chemical adsorption of a gas w.r.t pressure and temperature. Write the expression of Freundlich adsorption isotherm for the adsorption of gas. 2
9. Write two basic difference between physisorption and chemisorption. 2
 

**(OR)**

Name the four factors which influence the absorption of gas on a solid.
10. State Henry's law. At same temperature hydrogen is more soluble in water than Helium. Which of them will have higher value of  $K_H$ ? 2
11. Define Packing efficiency in a crystal. Derive the packing efficiency in a FCC. 3
12. State Kohlrausch law. Calculate  $\Lambda^{\circ} m$  for  $CH_3COOH$ , if  $\Lambda^{\circ} m HCl = 426 \text{ scm}^2 \text{ mol}^{-1}$   
 $\Lambda^{\circ} m NaCl = 126 \text{ scm}^2 \text{ mol}^{-1}$   $\Lambda^{\circ} m CH_3COONa = 91 \text{ scm}^2 \text{ mol}^{-1}$  3
13. How the number of tetrahedral voids and octahedral voids related to the number of atoms? A compound from hexagonal closed packed structure. What is the total number of voids in 0.5 moles of it? How many of these are tetrahedral voids? 3
14. How do you convert the following : 3
  - a) Chlorobenzene to biphenyl
  - b) Propane to 1-iodopropane
  - c) 2-Bromobutane to but-2-ene
15. Give reasons : 3
  - (a) Osmotic pressure method is preferred to other colligative properties in determining the molecular mass of a polymer.
  - (b) Sodium chloride solution freezes at a lower temperature than water but boils at a higher temperature.
  - (c) Scuba divers carry air diluted with Helium.
16. (a) The cleavage of alkyl phenyl ether with HBr always give phenol and alkylbromide and not bromobenzene and alkanol. Why? 3
  - (b) How does Luca's reagent help in the distinction of primary, secondary and tertiary alcohols?
17. Study the given graph and answer the following questions : 3
  - (a) Predict the order of reaction and write the unit for its rate constant.
  - (b) Derive the Half life Period for this reaction.
18. Explain the following :
  - (a) Sandmeyer's reaction
  - (b) Swart's reaction
  - (c) Friedel-Crafts alkylation
19. Account for the following : 3
  - a) Physisorption decreases with the increase in temperature.
  - b) It is necessary to remove CO when ammonia is obtained by Haber's process.
  - c) Ester hydrolysis is slow in the beginning and become faster after sometime.

**(OR)**

- a) Powdered substances are more effective adsorbents than their crystalline form.
- b) Enthalpy of adsorption is higher in chemisorption.
- c) Zeolites are called shape-selective catalyst.



