

## HOLIDAY HOMEWORK

### CLASS –XII ENGLISH

- 1) 2 Passages for note making.
- 2) 2 Passages for reading comprehension.
- 3) Cut from the newspaper ten different advertisements and paste in the notebook.
- 4) Download and see the movie “Lord of the Flies” and attempt five questions, 2 on plot, 2 on characterization, 1 on theme.
- 5) One formal letter, one informal letter, one report, one letter of placing an order.
- 6) Attempt all the questions and answer of the chapter ENEMY.

### (COMPUTER SCIENCE)

### CLASS XII

1. Write a program to count the no. of vowels in a given line of text.
2. What is the difference between object oriented programming and procedural programming?
3. How does OOP overcome the shortcomings of traditional programming approaches?
4. Reusability of classes is one of the major properties of OOP. How is it implemented in C++?
5. How is matching done in case of function overloading?
6. When should default arguments be preferred over function overloading and vice-versa?
7. When will you make a function inline and why?
8. For which values of the variable ‘testnum’ will the following code become infinite:

```
int number=1, testnum;

cin>>testnum;

while(1)

{ cout<<number;

    if (number==3)

        break;

    number+=testnum;

}
```

9. Define a class Teacher with the following specification:

**Private members:**

- Name 20 Characters
- Subject 10 Characters
- Basic, DA, HRA float
- Salary float
- Calculate() function which computes the salary and returns it. Salary is sum of Basic, DA, and HRA. And also calculate DA as 57% of Basic and HRA as 30% of Basic.

**Public members:**

- Constructor to assign Name as “Null”, Subject as English and Basic, DA, HRA, Salary as 0.0.
- ReadData() function which accepts the data values and invoke the function Calculate().
- DisplayData() function which prints the data on the screen.

10. Define a class Housing with the following specification:

a. **Private members:**

- i. Name 20 Characters
- ii. Type Character
- iii. Cost float
- iv. Reg\_no integer (range 10-1000)

b. **Public members:**

- ReadData() function to read an object of Housing type.
  - DisplayData() function which prints the details of an object.
  - Function Draw\_nos() to chose and display the details of two houses selected randomly from an array of ten objects of type Housing. Use random function to generate the registration numbers to match with Reg\_no from the array.
11. What do you mean by Polymorphism? Illustrate its example in C++.

12. Answer the questions (i) to (iv) based on the following code :

```
class Capsule
{
    char Category[20];
    char Date_of_manufacture[10];
    char Company[25];
    float cost;
public:
    Capsule();
    void entercapsuledetails( );
    void showcapsuledetails( );
};

class Tablet
{
    protected:
        char tablet_name[25];
        char Volume_label[10];
    public:
        float Price;
        Tablet();
        void entertabletdetails( );
        void showtabletdetails( );
};
```

```

};
class PainReliever : public Tablet, private Capsule
{
    int Dosage_units;
    char Side_effects[20];
    int Use_within_days;
public:
    PainReliever();
    void enterdetails( );
    void showdetails( );
};

```

(i) How many bytes will be required by an object of class PainReliever ?

(ii) Write names of all the members which are accessible from the object of class PainReliever.

(iii) Write the name of the type of inheritance?

(iv) Write names of all the members which are accessible from member function class PainReliever.

(v) Write names of all the members of class Capsule which are accessible from member function of class PainReliever.

13. Find the output of following code fragment:-

```

void main()
{
    int r, x, y, r1;
        clrscr();
        cout<<"Enter any two Numbers :->";
        cin>>x>>y;
        r=1; r1=0;
        while (r!=0)
        {
            r=x%y;
            r1=y/x;
            y=x;
            x=r;
        }
        cout<<"OUTPUT is:->"<<r1;
}

```

Suppose the inputs entered by the user are: -> 50, 75.

14. Find out the errors if any, in the following code:-

```

#include<iostram.h>
void main()
{
    int a,b,c;
    c=div(a,b)
    cout<<c;
}
int div(int x, int y)
{
    x=x+y;
    y=y+y;
}

```

```

    return(x,y);
}

```

15. Review Chapters 1-6.

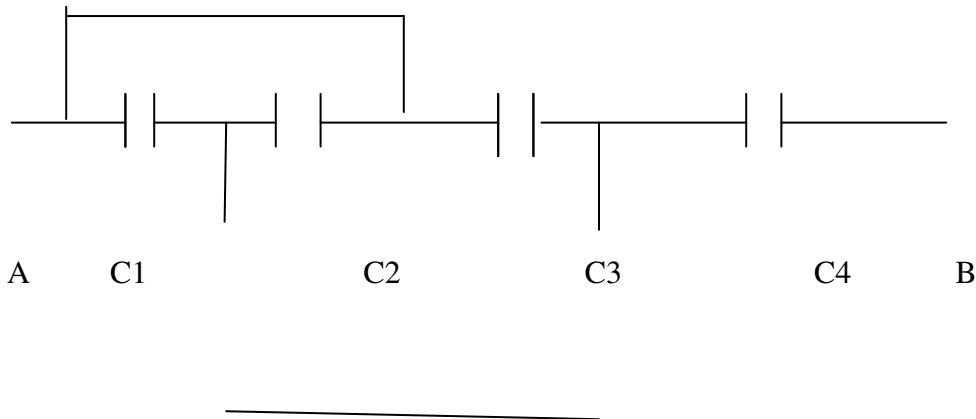
### PHYSICS

Draw electric field lines for:

- i) Charge  $q > 0$
- ii)  $q < 0$
- iii) Two equal and opposite charges.
- iv) Two equal and similar charges.

2) Two capacitor of capacitances  $2\mu\text{F}$  and  $2\mu\text{F}$  are connected first in series and then parallel. What is the ratio of their capacitances?

3). Calculate the equivalent capacitance between the points A and B in the combination shown below:

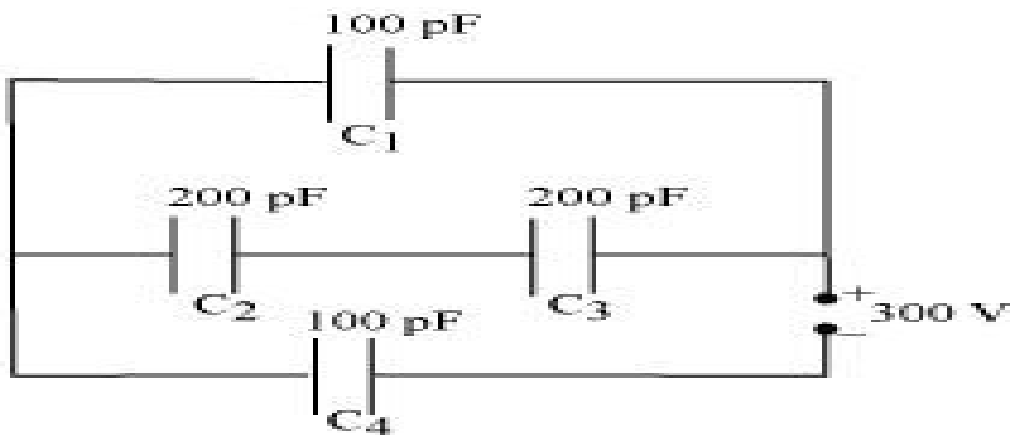


Given  $C_1 = 5\mu\text{F}$ ;  $C_2 = 10\mu\text{F}$ ;  $C_3 = 15\mu\text{F}$ ;  $C_4 = 30\text{Mf}$

- 4). Electric dipole uniform electric field from Define electric dipole moment. What is its direction? Write its SI unit.
- 5). For what value of angle between dipole moment and electric field the dipole remain in (i) stable, (ii) unstable equilibrium?
- 6). Calculate the work done in rotating an electric dipole  $90^\circ$  to an angle  $\theta$ .
- 7). State Gauss' law in electrostatics. Find electric field due to infinitely charged long straight uniformly charged wire of linear charge density  $\lambda$  at a given point using Gauss' law. Draw 'E' vs distance.
- 8). Find electric field at a point due to uniformly charged infinite plane sheet with surface charge density ' $\sigma$ '. Draw 'E' vs distance from sheet.

- 9). Derive the expression for an electric field due to an electric dipole at a point on axial line.
- 10). Derive the expression for an electric field due to an electric dipole at a point on equatorial line.
- 11). Show that the energy stored in a parallel plate capacitor is  $\frac{1}{2} CV^2$ . Hence derive the expression for energy density.
- 12). Obtain an expression for the capacitance of a parallel plate capacitor with a conductor in between the plates of the capacitor.
- 13). Obtain an expression for the capacitance of a parallel plate capacitor with a di-electric slab in between the plates of the capacitor.
- 14). Give the principle and labeled diagram of Van-de-Graff Generator.
- 15). Two fixed point charges  $+4e$  and  $+e$  are separated by a distance 'a', where should the third point charge be placed for it to be in equilibrium.

Obtain the equivalent capacitance of the network in Fig. 2.35. For a 300 V supply, determine the charge and voltage across each capacitor.



- (a) In a metre bridge [see NCERT Fig. 3.27], the balance point is found to be at 39.5 cm from the end A, when the resistor  $Y$  is of  $12.5 \Omega$ . Determine the resistance of  $X$ . Why are the connections between resistors in a Wheatstone or meter bridge made of thick copper strips?
- (b) Determine the balance point of the bridge above if  $X$  and  $Y$  are interchanged.
- (c) What happens if the galvanometer and cell are interchanged at the balance point of the bridge? Would the galvanometer show any current?

- 16.) NCERT Exercise problem no.1.8
- 17.) NCERT Exercise problem no.1.18
- 18.) NCERT Exercise problem no.1.26

19). Define electric flux. Write its SI unit

A charge  $q$  is enclosed by a spherical surface of radius 'R'. If the radius is reduced to half, how would the electric flux through the surface change

20). Write an expression for the potential energy of two point charges  $q_1$  and  $q_2$ , separated by distance  $r$  in an electric field  $E$ .

21.) Derive an expression for the potential energy of a dipole in a uniform electric field.

Discuss the conditions of stable and unstable equilibrium.

### Current Electricity

1). Draw the variation of resistivity with temperature for (i) Metals (ii) semiconductors and (iii) alloys.

2). What is change in resistivity of a conductor when it is (i) cut into half (ii) stretched to twice its length?

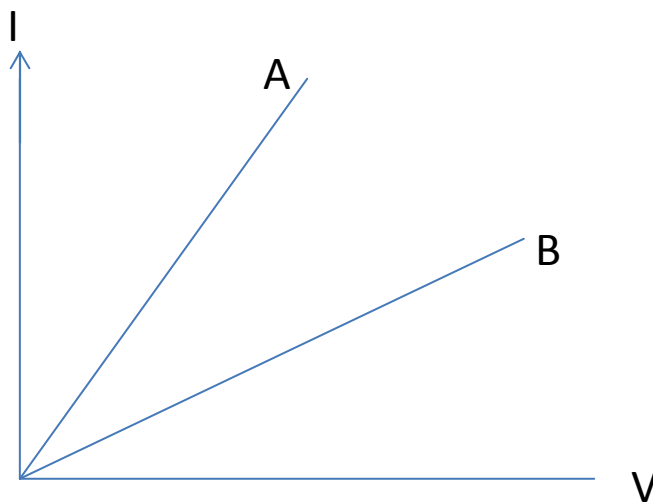
3). Write colour code for carbon resistors having resistance: (i)  $1\ \Omega$  (ii)  $10\ \Omega$  (iii)  $10\ k\Omega$ .

4). Draw the circuit diagram for comparing the emf's of two primary cell using potentiometer and write the formula used.

5). Draw the circuit diagram for determining the internal resistance of primary cell using potentiometer. Write the formula used.

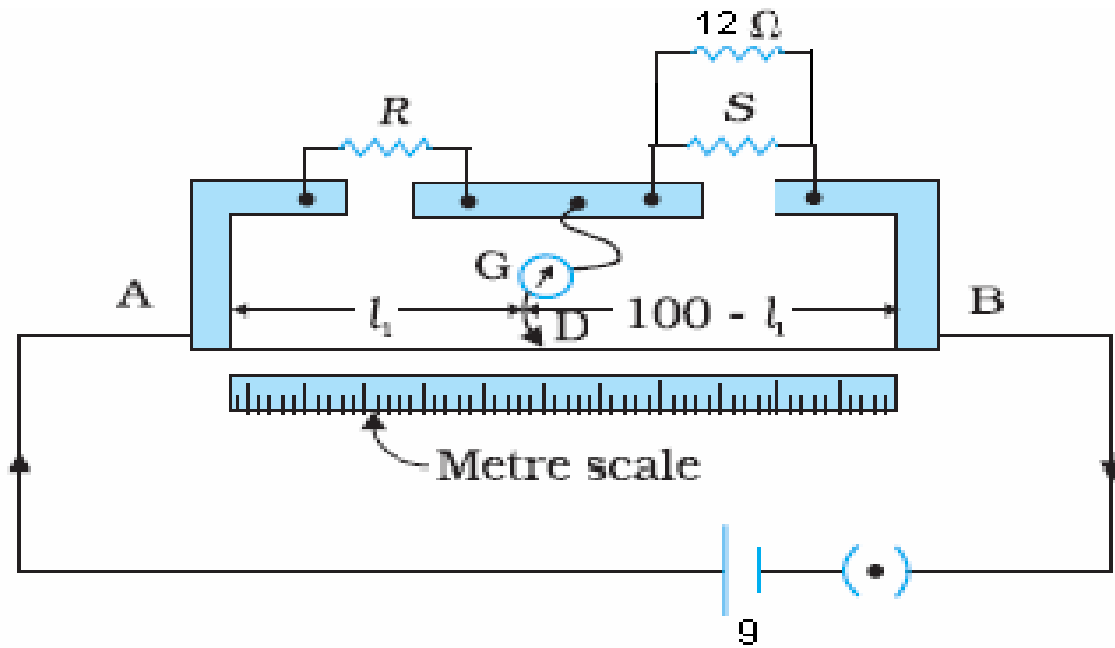
6). Derive an expression for vector form of Ohm's Law.

7). V- I graph of two metallic wires of same length and cross sectional area are given below. Which of these has higher resistance?

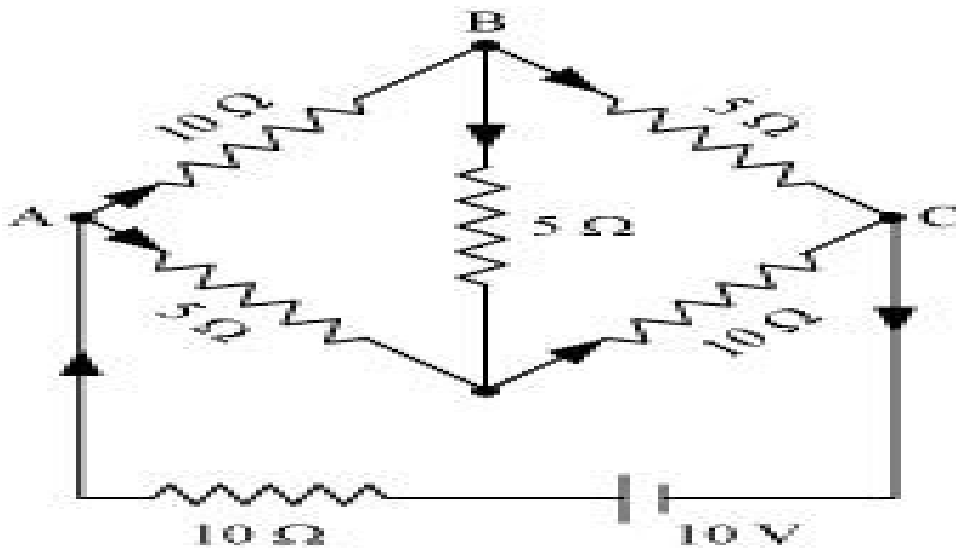


8). In a meter bridge, the null point is found at a distance of 40 cm from A. If a resistance of  $12\ \Omega$  is connected in parallel with S, the null point occurs at 50.0 cm from A.

Determine the values of R and S.

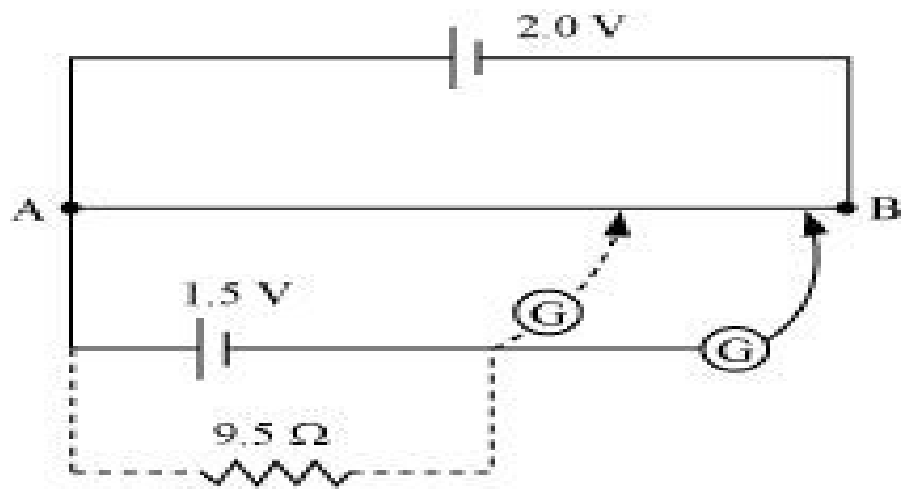


9). Determine the current in each branch of the network shown in fig 3.30:



.....

10).Figure 3.35 shows a 2.0 V potentiometer used for the determination of internal resistance of a 1.5 V cell. The balance point of the cell in open circuit is 76.3 cm. When a resistor of  $9.5 \Omega$  is used in the external circuit of the cell, the balance point shifts to 64.8 cm length of the potentiometer wire. Determine the internal resistance of the cell.



- 11). NCERT Exercise problem no.2.31.
- 12.) NCERT Exercise problem no.2.34.
- 13). NCERT Exercise problem no.2.37.



ग्रीष्मकालीन अवकाश

गृहकार्य

कक्षा बारहवीं [केन्द्रिक]

1. किन्हीं दो अपठित गद्यांशों की व्याख्या कीजिए व उसमें से दस-दस प्रश्न बनाएँ व उनके उत्तर दीजिए।
2. किन्हीं दो अपठित पद्यांशों की व्याख्या कीजिए व उसमें से पांच-पांच प्रश्न बनाएँ व उनके उत्तर दीजिए।
3. महानगरों में बढ़ते अपराध व 'महँगी शिक्षा' पर आकड़ों, कार्टून, चार्ट व फोटो आदि से रोचक फीचर बनाएँ।
4. गंगा प्रदूषण के प्रति जागरूकता पैदा करने के लिए किसी दैनिकसमाचार पत्र के लिए सम्पादकीय तैयार कीजिये।
5. निबंध लेखन - तनाव - आधुनिक जीवन शैली की देन।  
सहशिक्षा की प्रासंगिकता।
6. पत्र लेखन - दूरदर्शन के प्रसारित कार्यक्रमों की समीक्षा करते हुए दूरदर्शन के निदेशक को पत्र लिखिये और अपने सुझाव भी दीजिये।
7. भ्रूण हत्या में हो रही वृद्धि पर चिंता प्रकट करते हुए किसी हिंदी के समाचार पत्र को अपने सुझाव देते हुए पत्र लिखिए।
8. किन्हीं तीन हिंदी के दैनिक समाचार पत्रों को पढ़िए और 'सूचनाओं का केंद्र या मुख्य आकर्षण' समाचार की प्रस्तुति, समाचार की भाषा शैली उपर्युक्त बिन्दुओं के संदर्भ में उनका तुलनात्मक अध्ययन कीजिए।

## Biology

### SEXUAL REPRODUCTION---FLOWERING PLANTS

1. Banana is a true fruit but is also a parthenocarpic fruit. Give reason.
2. Why is coconut plant referred to as monoecious?
3. Name the part of flower that contributes to fruit formation in strawberry and guava respectively.
4. Name the cell from which the endosperm of coconut develops. Give the characteristic features of endosperm of coconut.
5. Name the blanks spaces a, b, c, d from the table given below .

Item	What it represent in plant
Pericarp	a
b	Cotyledon in seeds of grass family
Embryonal axis	
d	ns of nucellus in seed

6. Fertilization is essential for the production of the seeds, but in some angiosperms seeds develop without fertilization.

(a) Give an example of an angiosperm that produces seeds without fertilization. Name the process

(b) Explain the two ways by which seeds develop without fertilization.

7. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle.

8. How does penicillium reproduce asexually?

9. A moss plant produces a large no. of antherozoids but relatively only a few egg cells. Why?

10. A bilobed dithecous anther has 100 microspore mother cells per microsporangium. How many male gametophytes this anther can produce?

11. Where is sporopollenin present in the plants? State its significance with reference to its chemical.

12. (a) Draw a diagram of T. S. of a mature anther. Label only the layers that help in dehiscence of the anther to release pollen grains

(b) Why is the exine of a pollen grain not a continuous layer?

13. Explain the following giving reasons:

(a) Pollen grains are well preserved as fossils.

(b) Pollen tablets are in use of the people these days.

14. (a) Draw a labeled diagram of a mature embryo sac of an angiosperm.

(b) Describe the stages in embryo development in a dicot plant

15. State one advantage and one disadvantage of cleistogamy.

16. What is geitonogamy? Give its one similarity to (a) Autogamy and (b) Xenogamy

17. Explain the four devices that promote the cross-pollination in flowering plants.

18. (a) Write the characteristic features of anther, pollen and stigma of a wind-pollinated flower

(b) How do flowers reward their insect pollinators? Explain.

19.

(a) Identify the figure.

(b) Name the initial cell from which this structure has developed.

(c) Draw the next mature stage and label the parts.

20. (a) Describe in sequence the process of megasporogenesis in an angiosperm.

(b) Draw the seven-celled and eight-nucleus structure of the female gametophyte and label all the different parts.

21. How does pollen mother cell develop into a mature pollen grain? Illustrate the stages with labeled diagram.
22. Give reasons-
- Most zygotes in angiosperms divide only after certain amount of endosperm is formed.
  - Groundnuts are exalbuminous and castor seeds are albuminous.
  - Micropyle remains as a small pore in the seed coat of a seed.
  - Integuments of an ovule harden and water content is highly reduced as the seed matures.
  - Apple and cashewnuts are not called true fruit.
  - Anthers of an angiosperm flower are described as dithecous.
  - Hybrid seeds have to be produced year after year.
23. (a) How are seeds advantageous to angiosperms?  
 (b) Draw a labeled L.S. of a castor seed.
24. (a) What is apomixis? Give its advantage.  
 (b) Differentiate between apomixis and polyembryony.
25. The flower of brinjal is referred to as chasmogamous while that of beans is cleistogamous. How are they different from each other?
26. Mention a characteristic feature and a function of zoospores in some algae.
27. Draw a labeled diagram of a male gametophyte of an angiosperm. Label any four parts.

## **HUMAN REPRODUCTION AND REPRODUCTIVE HEALTH**

- Write the location and function of Sertoli cells in humans.**
- Give reasons for the following---**
  - the human testes are located outside the abdominal cavity.**
  - Some organisms like honey bees are called parthenogenetic animals.**
- (a) Where are fimbriae present in a human female reproductive system? Give their function.**  
**(b) Where are Leydig cells present? What is their role in reproduction?**
- Draw a labeled diagram of a human sperm.**
- Differentiate between major structural changes in the human ovary during the follicular and luteal phases of menstrual cycle.**
- How and at what stage of menstrual cycle is corpus luteum formed in human female? Give its function. When does it regress?**
- Write the function of each of the following:**
  - Middle piece in human sperm**
  - Tapetum in anther.**
  - Luteinising hormone in human males.**
  - Seminal vesicle**
  - Scutellum**
  - Acrosome of human sperm.**
- Draw a labeled section view of human testis showing seminiferous tubules.**
- Draw a section view of human ovary. Label the following parts:**
  - primary follicle**
  - Graafian follicle**
  - Ovum**
  - Corpus luteum**
- Give the schematic representation showing the events of spermatogenesis in human male.**
- (i) Describe the stages of oogenesis in human females**  
**(ii) Draw a labeled diagram of a human ovum released after ovulation.**
- Give a schematic representation of oogenesis in human female indicating the chromosomal number at each step. Mention at what stage of female life does each phase occur.**

13. Study the flow chart given below. Name the hormones involved at each stage and explain their role.

Ovulation  
Pregnancy lactation  
Placenta  
Foetal growth  
Parturition

14. Study the flow chart given below. Name the hormones involved at each stage and explain their role.

Hypothalamus  
Pituitary  
Testis  
Sperms  
Or

Hypothalamus  
Pituitary  
Ovary  
Pregnancy

15. Mention the target cells of luteinizing hormone in human males and females. Explain the effect and changes which the hormone induce in each case.

16.(i) Give a schematic representation of spermatogenesis in humans.

(ii) At which stage of life does gametogenesis begin in human male and females

(iii) Name the organ where gametogenesis gets completed in human male and female respectively.

17. A woman has conceived and implantation has occurred in her uterus. Explain the sequence of changes upto parturition which take place within her body.

18 (a) Where do the signals for parturition originate from in human?

(b) Why is it important to feed the newborn babies on colostrum?

19. Where is morula formed in humans? Explain the process of its development from zygote.

20.(a) Mention the function of trophoblast in human embryo.

(b) Where are the stem cells located in the blastocyst?

21. Why is Cu-T considered a good contraceptive device to space children?

22. Why is Saheli' considered to be an improved form of oral contraceptive for human females?

23. Describe the lactational amenorrhoea method of birth control.

24 What is amniocentesis? Why has the government imposed a statutory ban in spite of its importance in medical field?

25 (a) Expand IUD.

(b) Why is hormone releasing IUD considered a good contraceptive to space children?

26. A pregnant human female was advised to undergo MTP. It was diagnosed by her doctor that the foetus she is carrying has developed from a zygote formed by an XX-egg fertilized by Y-carrying sperm. Why was she advised to undergo MTP?

27. How are ART helpful to humans ?. How are ZIFT and GIFT Different from intra uterine transfers . Explain

28.(a) Give any two reasons for infertility among young couples .

(b) Test tube baby programme is a boon to such couples. Explain the steps followed in the procedures.

29. Expand STD. Give two examples. Name the STDs which can be transmitted through contaminated blood.

30. Why is tubectomy considered a contraceptive method ?

**CHEMISTRY**  
**VALUE ADDED QUESTIONS**

Q 1) Ram takes a open pan to cook vegetables at a hill station while shyam cook the same vegetables in a pressure cooker at the same place.

- (a) Explain with reason who will cook vegetable faster.
- (b) Mention the reason for the delay in cooking.
- (c) Which value is learnt by the student in the process of cooking food in the pressure cooker.

Q 2) In Apollo Space programs, hydrogen-oxygen fuel cell was used.

- (a) Explain why, fuel cell is preferred in space programme.?
- (b) Mention the values associated with the decision of using fuel cell?

Q 3) Ira a student of science went with her grandfather to buy a battery for their inverter and camera. They found two types of batteries, one a lead storage battery and other a Nickel-Cadmium storage battery. Later was more expensive but lighter in weight. Ira insisted to purchase costlier Nickels-Cadmium battery.

- (a) In your opinion, why Ira insisted for Nickel-Cadmium battery? Give reasons
- (b) Write the values associated with above decision?

Q 4) Smoke is colloidal solution of solid particles such as Carbon, arsenic com- pounds dust, etc. in air. Precipitation of smoke particles coming from the chimney of factories is carried out by Cottrel Precipitator and Carbon free air passes out through the chimney.

- (a) Name the principle used in the Cottrel Precipitator.
- (b) How smoke precipitator causes precipitation and settling of smoke particles.
- (c) Name the value learnt by the use of this Cottrel Precipitator.

Q 5) Scuba divers when come towards the surface, the pressure gradually de- creases resulting in the released of dissolved gases leading to formation of bubbles of nitrogen gas in the blood which blocks the capillaries and thus harmful kinds are created. To avoid bends and toxic effects of high concentration of nitrogen gas, the air is diluted with helium. After reading the above passage, answer the following questions.

- i) Why is the harmful condition of bends overcome by the use of helium.
- ii) Which law is used to calculate the concentration of gases in solution.
- iii) Mention the value associated with providing divers air diluted with helium.

Q 6) People are advised to limit the use of fossil fuels resulting in Green House Effect leading to a rise in the temperature of earth. Hydrogen provides an ideal alternative and its combustion in fuel cells.

1. Write electrode reaction in H<sub>2</sub>-O<sub>2</sub> fuel cell.
2. How is green house effect reduced by the use of fuel cells?
3. Write the values associated with preference of using fuel cells to fossil fuel.

**HOT'S**

Q 1) In Corundum, O<sup>2-</sup> ions from hcp and Al<sup>3+</sup> occupy two third of octahedral voids. Determine the formula of corundum.

Q2) The density of copper metal is 8.95 g cm<sup>-3</sup>. If the radius of copper atom is 127 pm, Is the copper unit cell have a simple cubic, a body-centred cubic or a face centred cubic structure? (Given at. mass of Cu = 63.54 g mol<sup>-1</sup> and N<sub>A</sub> = 6.02 × 10<sup>23</sup> mol<sup>-1</sup>]

Q3) Account for the following :-

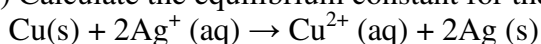
- (a)  $\text{CaCl}_2$  is used to clear snow from roads in hill stations.
- (b) Ethylene glycol is used as antifreeze solution in radiators of vehicles in cold countries.
- (c) The freezing point depression of 0.01 m NaCl is nearly twice that of 0.01 m glucose solution.

Q4) 15.0 g of an unknown molecular substance was dissolved in 450 g of water. The resulting solution was found to freeze at  $-0.34^\circ\text{C}$ . What is the molar mass of this substance. ( $K_f$  for water =  $1.86 \text{ K kg mol}^{-1}$ ).

Q5) An aqueous solution containing 3.12 g of barium chloride in 250 g of water is found to be boil at  $100.083^\circ\text{C}$ . Calculate the degree of dissociation of barium chloride. [Given molar mass  $\text{BaCl}_2 = 208 \text{ g mol}^{-1}$ ,  $K_b$  for water =  $0.52 \text{ K/m}$ ]

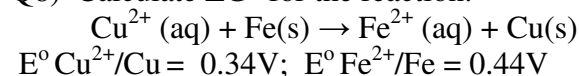
- Q6) (a) Write the mechanism of the corrosion of metals.  
(b) How is underground iron pipe is protected from corrosion?

Q7) Calculate the equilibrium constant for the reaction at  $25^\circ\text{C}$ .



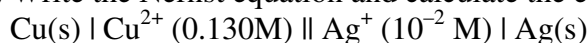
The standard cell potential for the reaction at  $25^\circ\text{C}$  is 0.46V. [Given  $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ]

Q8) Calculate  $\Delta G^\circ$  for the reaction.



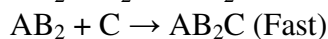
$$E^\circ \text{Cu}^{2+}/\text{Cu} = 0.34\text{V}; E^\circ \text{Fe}^{2+}/\text{Fe} = 0.44\text{V}$$

Q 9) Write the Nernst equation and calculate the emf of the following cell at 298K.



Given  $E^\circ \text{Cu}^{2+}/\text{Cu} = 0.34\text{V}$  and  $E^\circ \text{Ag}^+/\text{Ag} = 0.80\text{V}$

Q 10) Write the rate law and order for the following reaction :



Q 11) The rate of reaction triples when the temperature changes from  $20^\circ\text{C}$  to  $50^\circ\text{C}$ . Calculate the energy of activation. [ $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ,  $\log 3 = 0.48$ ]

Q12) For a chemical reaction, activation energy is zero and at 300K rate constant is  $5.9 \times 10^{-5} \text{ s}^{-1}$ , what will be the rate constant at 400K?

**Q Prepare a list of formulas of each chapter in physical chemistry.**

### MATHEMATICS

#### RELATIONS AND FUNCTIONS

1. Show that the relation R in the set  $R$  of real numbers, defined as  $R = \{(a, b) : a \leq b^2\}$ , is neither reflexive nor symmetric nor transitive.
2. Show that the relation R defined by  $(a, b) R (c, d)$  if and only if  $a + d = b + c$  on the set  $N \times N$  is an equivalence relation.
3. Show that the relation R in the set  $A = \{x : x \in W, 0 \leq x \leq 12\}$  given by  $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$  is an equivalence relation. Also find the set of all elements related to 2.
4. If  $R_1$  and  $R_2$  are equivalence relations in a set A, show that  $R_1 \cap R_2$  is also an equivalence relation in A.

5. If  $f: R - \left\{\frac{3}{5}\right\} \rightarrow R - \left\{\frac{3}{5}\right\}$  be a function defined by  $f(x) = \frac{3x+2}{5x-3}$ ,  $x \in R - \left\{\frac{3}{5}\right\}$ . Show that  $f^{-1}(x) = f(x)$ ,  $x \in R - \left\{\frac{3}{5}\right\}$ .
6. Consider  $f: R^+ \rightarrow [-5, \infty)$  given by  $f(x) = 9x^2 + 6x - 5$ . Show that  $f$  is invertible. Find the inverse of  $f$ .
7. A function  $f: N \rightarrow R$  is defined by
- $$f(n) = \begin{cases} \frac{n-1}{2} & \text{if } n \text{ is odd} \\ \frac{n}{2} & \text{if } n \text{ is even} \end{cases} . \text{ Show that this function is a bijection.}$$
8. A function  $f: N \rightarrow N$  is defined by
- $$f(n) = \begin{cases} n+1 & \text{if } n \text{ is odd} \\ n-1 & \text{if } n \text{ is even} \end{cases} . \text{ Show that this function is a bijection.}$$
9. If  $f$  be a greatest integer function and  $g$  be the absolute value function. Find the value of  $(f \circ g)\left(-\frac{3}{2}\right) + (g \circ f)\left(\frac{4}{3}\right)$ .
10. Let  $f: R \rightarrow R$  be defined as  $f(x) = 7x + 3$ . Find a function  $g: R \rightarrow R$  such that  $f \circ g = g \circ f = I_R$ .
11. Let '\*' be a binary operation on  $Q$  defined by  $a * b = \frac{ab}{5}$
- Show that operation  $*$  is commutative as well as associative.
  - Find the identity element, if any, in  $Q$ .
  - Every non zero element is invertible. If  $a \neq 0 \in Q$ , find its inverse.
12. Let '\*' be an operation defined on set  $Q - 1$  as  $a * b = a + b + ab$  for all  $a, b \in Q - 1$ . Prove that :
- '\*' is a binary operation on  $A$ .
  - '\*' is commutative as well as associative
  - the no. 0 is the identity element
  - every element  $a \in Q - 1$  has  $\frac{-a}{a+1}$  as inverse.
  - If,  $2 * x * 5 = 4$  then  $x = -\frac{13}{18}$ .
13. Let  $X$  be a non empty set.  $P(X)$  be its power set. Let '\*' be an operation defined on element of  $P(X)$  by  $A * B = A \cap B \quad \forall A, B \in P(X)$ . Then ,
- Prove that '\*' is a binary operation on  $P(X)$
  - is '\*' commutative and associative ?
  - Find the identity element in  $P(X)$  w.r.t '\*'
  - Find all the invertible elements of  $P(X)$ .
  - If  $\circ$  is another binary operation defined on  $P(X)$  as  $A \circ B = A \cup B$ , then verify that  $\circ$  distributes itself over '\*'.
14. Define a binary operation '\*' on the set  $\{0,1,2,3,4,5\}$  as
- $$a * b = \begin{cases} a + b & \text{if } a + b < 6 \\ a + b - 6 & \text{if } a + b \geq 6 \end{cases} . \text{ Show that zero is the identity for this operation and each element } a (\neq 0) \text{ of the set is invertible with } 6 - a \text{ being the inverse of } a.$$
15. Show that the relation  $R$  on set  $N \times N$  defined by  $(a, b) R (c, d)$  iff  $ad (b + c) = bc (a + d)$  is an equivalence relation.
16. Show that the function  $f: R \rightarrow \{x: x \in R, -1 < x < 1\}$  given by  $f(x) = \frac{x}{1+|x|}$  is bijective.
17. If  $A = N \times N$  and '\*' on  $A$  is defined by  $(a, b) * (c, d) = (ad + bc, bd)$  for all  $(a, b), (c, d) \in A$ , then show that
- '\*' is a binary operation on  $A$ .
  - '\*' is commutative on  $A$ .
  - '\*' is associative on  $A$ .
  - $A$  has no identity element with respect to the given operation.

## INVERSE TRIGONOMETRIC FUNCTIONS

- Find the value of  $\tan^{-1} \left( \sin^{-1} \frac{2x}{1+x^2} + \cos^{-1} \frac{1-x^2}{1+x^2} \right)$ .
- Solve the following equations :
  - $\sin^{-1}(1-x) - 2 \sin^{-1} x = \frac{\pi}{2}$
  - $\tan^{-1} \left( \frac{x-1}{x+1} \right) + \tan^{-1} \left( \frac{2x-1}{2x+1} \right) = \tan^{-1} \left( \frac{23}{36} \right)$
  - $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$
- Prove the following :
  - $2 \tan^{-1} \frac{1}{5} + \sec^{-1} \frac{5\sqrt{2}}{7} + 2 \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$
  - $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 = 2 \left( \tan^{-1} 1 + \tan^{-1} \frac{1}{2} + \tan^{-1} \frac{1}{3} \right) = \pi$
- Write the following into simplest form :
  - $\tan^{-1} \left( \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right)$
  - $\sin^{-1} \left( \frac{2}{\sqrt{13}} x + \frac{3}{\sqrt{13}} \sqrt{1-x^2} \right)$
- Prove that  $\tan^{-1} \left[ \frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}} \right] = \frac{\pi}{4} + \frac{1}{2} \cos^{-1} x^2 = \frac{1}{2} \sin^{-1} x^2$
- Prove that  $\tan \left( \frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b} \right) + \tan \left( \frac{\pi}{4} - \frac{1}{2} \cos^{-1} \frac{a}{b} \right) = \frac{2b}{a}$ .
- Prove that  $\cos(\tan^{-1}(\sin(\cot^{-1} x))) = \sqrt{\frac{1+x^2}{2+x^2}}$ .
- If  $\cos^{-1} \frac{x}{a} + \cos^{-1} \frac{y}{b} = \alpha$ , show that  $\frac{x^2}{a^2} - \frac{2xy}{ab} \cos \alpha + \frac{y^2}{b^2} = \sin^2 \alpha$ .
- Prove that  $\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$ .
- Evaluate  $\sin^{-1}(\sin 10)$ .
- Solve :  $\sin^{-1} x - \cos^{-1} x = \sin^{-1}(3x - 2)$ .
- If  $-1 \leq x, y, z \leq 1$  such that  $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$ , find the value of  $x^{2000} + y^{2001} + z^{2002} - \frac{9}{x^{2000} + y^{2001} + z^{2002}}$
- Prove that :  $\frac{1}{2} \tan^{-1} x = \cos^{-1} \left( \sqrt{\frac{1+\sqrt{1+x^2}}{2\sqrt{1+x^2}}} \right)$ .
- Prove that:  $2 \tan^{-1} \left[ \sqrt{\frac{a-b}{a+b}} \tan \frac{\theta}{2} \right] = \cos^{-1} \left[ \frac{b+a \cos \theta}{b-a \cos \theta} \right]$

## MATRICES AND DETERMINANTS

- If  $A = \begin{bmatrix} 2 & -2 \\ -4 & 2 \\ 5 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ , find the matrix  $X$ , such that  $2A + 3X = 5B$ .
- Find a matrix  $X$  such that  $X \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$ .
- Let  $A = \begin{bmatrix} 0 & -\tan \frac{\alpha}{2} \\ \tan \frac{\alpha}{2} & 0 \end{bmatrix}$  and  $I$ , the identity matrix of order 2. Show that  $I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$ .
- Let  $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ , show that  $(aI + bA)^n = a^n I + na^{n-1} bA$  for all  $n \in \mathbb{N}$ .
- Find  $x$ , if  $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = O$ .
- Let  $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , find  $x$  and  $y$  such that  $A^2 = xA + yI$ . Hence find  $A^{-1}$  and  $A^5$ .



7. Verify that  $(AB)^T = B^T A^T$ , where  $A = \begin{bmatrix} 3 \\ 1 \\ -2 \end{bmatrix}$  and  $B = [1 \quad -5 \quad 7]$ .

8. Express  $P =$

$$\begin{bmatrix} 4 & 3 & 7 \\ 6 & 5 & -8 \\ 1 & 2 & 6 \end{bmatrix} \text{ as the sum of a symmetric matrix and a skew symmetric matrix,}$$

verify your result.

9. Show that  $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left( \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + 1 \right)$

10. Show that  $\begin{vmatrix} a-b & b-c & c-a \\ b+c & c+a & a+b \\ a^2 & bc & ac+c^2 \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$

11. Show that  $\begin{vmatrix} a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} = 4a^2b^2c^2$

12. If  $x, y, z$  are all distinct and if  $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ , show that  $xyz = -1$ .

13. If  $a, b, c$  are real, and  $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$ , then show that either  $a + b + c = 0$  or  $a = b = c$ .

14. Solve the following equation (i)

$$\begin{vmatrix} x-1 & 2x-3 & 1 \\ x-3 & 2x-1 & 2 \\ x-5 & 2x-5 & 3 \end{vmatrix} = 0 \quad (ii) \quad \begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$$

15. Using properties of determinant, Show that  $\begin{vmatrix} 2y+4 & 5y+7 & 8y+a \\ 3y+5 & 6y+8 & 9y+b \\ 4y+6 & 7y+9 & 10y+c \end{vmatrix} = 0$ , where  $a, b, c$  are in A.P.

16. Using properties of determinant, Show that  $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix} = (ab+bc+ac)^3$ .

17. Using properties of determinant, Show that  $\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (c+a)^2 & bc \\ ca & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$ .

18. Find the matrix A satisfying the matrix equation  $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$

19. If  $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$ , show that  $A^T A^{-1} = \begin{bmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{bmatrix}$ .

20. Solve the following systems of equations :

(a)  $4x + 3y + 2z = 60, x + 2y + 3z = 45, 6x + 2y + 3z = 70$

(b)  $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1, \frac{6}{x} + \frac{9}{y} - \frac{20}{z} =$

$2; x, y, z \neq 0$

21. Find  $A^{-1}$ , where  $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ . Hence solve the equations :  $x + y + 2z = 0, x + 2y - z = 9, x - 3y + 3z = -14$ .

22. If  $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ , find  $AB$ . Hence, solve the system of equations :  $x - y = 3, 2x + 3y + 4z = 17, y + 2z = 7$

23. Show that the product AB of the matrices  $A = \begin{bmatrix} \cos^2\theta & \cos\theta \sin\theta \\ \cos\theta \sin\theta & \sin^2\theta \end{bmatrix}$  and  $B = \begin{bmatrix} \cos^2\phi & \cos\phi \sin\phi \\ \cos\phi \sin\phi & \sin^2\phi \end{bmatrix}$  is a null matrix, where  $\theta$  and  $\phi$  differ by an odd multiple of  $\frac{\pi}{2}$ .

24. If  $A + B + C = \pi$ , find the value of  $\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$ .

25. If  $p \neq a, q \neq b, r \neq c$  and  $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$ , show that  $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} = 2$ .

26. If  $a + b + c = 0$  and  $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ , then show that either  $x = 0$  or  $x = \pm \sqrt{\left(\frac{3}{2}\right)(a^2 + b^2 + c^2)}$ .

27. If  $x, y, z$  are all distinct and if  $\begin{vmatrix} x & x^3 & x^4 - 1 \\ y & y^3 & y^4 - 1 \\ z & z^3 & z^4 - 1 \end{vmatrix} = 0$ , show that  $xyz(yz + zx + xy) = x + y + z$ .

28. Prove that  $\begin{vmatrix} {}_1^xC & {}_1^nY & {}_1^nY \\ {}_1^nY & {}_1^nY & {}_1^nY \\ {}_1^nY & {}_1^nY & {}_1^nY \end{vmatrix} = \frac{1}{12}xyz(y-z)(z-x)(x-y)$ .

29. Obtain the inverse of the matrices

$$\begin{bmatrix} 1 & p & 0 \\ 0 & 1 & p \\ 0 & 0 & 1 \end{bmatrix} \text{ and } \begin{bmatrix} 1 & 0 & 0 \\ q & 1 & 0 \\ 0 & q & 1 \end{bmatrix}. \text{ And, hence find the inverse of the matrix } \begin{bmatrix} 1+pq & p & 0 \\ q & 1+pq & p \\ 0 & q & 1 \end{bmatrix}.$$

30. Find the inverse of the following matrices by using elementary transformations

$$\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & 1 \\ 2 & 1 & 0 \end{bmatrix}$$

31. If

$$A = \begin{bmatrix} \cos \alpha + \sin \alpha & \sqrt{2} \sin \alpha \\ -\sqrt{2} \sin \alpha & \cos \alpha - \sin \alpha \end{bmatrix},$$

$$\text{prove that } A^n = \begin{bmatrix} \cos n\alpha + \sin n\alpha & \sqrt{2} \sin n\alpha \\ \sqrt{2} \sin n\alpha & \cos n\alpha - \sin n\alpha \end{bmatrix} \forall n \in \mathbb{N}$$

32. If  $p, q, r$  are not in G.P and  $\begin{bmatrix} 1 & \frac{q}{p} & \alpha + \frac{q}{p} \\ 1 & \frac{r}{q} & \alpha + \frac{r}{q} \\ p\alpha + q & q\alpha + r & 0 \end{bmatrix} = 0$ , show that  $p\alpha^2 + 2q\alpha + r = 0$ .