

This question paper contains 4+2 printed pages]

**AD—312—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**PHYSICS**

**Paper VI**

**(Waves, Oscillations and Acoustics)**

**(MCQ + Theory)**

**(Thursday, 31-12-2015)      Time : 10.00 a.m. to 12.00 noon**

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*Time—Two Hours*

*Maximum Marks—40*

*N.B. :- (i) Attempt All questions.*

*(ii) Q. No. 1 is MCQ type. Answer MCQs on OMR sheet only.*

*(iii) Q. No. 2, Q. No. 3 and Q. No. 4 are descriptive type.*

*(iv) Negative marking system is applicable to MCQs.*

*(v) Symbols used in the question paper have their usual meanings.*

P.T.O.

## (MCQ)

1. Attempt all Multiple Choice Questions :

10

(i) The velocity of transverse waves along a string is :

(a)  $v = \sqrt{1/m}$

(b)  $v = \sqrt{T/m}$

(c)  $v = \sqrt{m/T}$

(d)  $v = \sqrt{1/T}$

(ii) The differential equation of motion of vibrating string is :

(a)  $\frac{d^2y}{dt^2} = \frac{1}{m} \frac{d^2y}{dx^2}$

(b)  $\frac{d^2y}{dt^2} = \frac{1}{T} \frac{d^2y}{dx^2}$

(c)  $\frac{d^2y}{dt^2} = \frac{T}{m} \frac{d^2y}{dx^2}$

(d)  $\frac{d^2y}{dt^2} = - \frac{T}{m} \frac{dy}{dx}$

(iii) The energy of a plane progressive wave is :

(a)  $E = 2\pi^2 \rho n^2 a^2$

(b)  $E = \pi^2 \rho n^2 a^2$

(c)  $E = 2\pi^2 n^2 a^2$

(d)  $E = \pi^2 n^2 a^2$

(iv) The total energy per wavelength in a stationary wave is ..... that in a progressive wave.

- (a) single
- (b) multiple
- (c) constant
- (d) double

(v) In a stationary wave, the strain is maximum at .....

- (a) nodes
- (b) antinodes
- (c) nodes and antinodes
- (d) zero position

(vi) In free vibration the amplitude of swing :

- (a) Decreases
- (b) Increases
- (c) Remains constant
- (d) Becomes zero

- (vii) When vibratory motion produced in a body by the influence of another body when their time periods are exactly equal are known as :
- (a) Resonance
  - (b) Stationary wave
  - (c) Progressive wave
  - (d) Standing wave
- (viii) Ultrasonic wave has frequency :
- (a) Greater than 1 kHz
  - (b) Less than 1 kHz
  - (c) Greater than 10 kHz
  - (d) Greater than 20 kHz
- (ix) The decibel is a measure of :
- (a) Sound
  - (b) Light
  - (c) Current
  - (d) Voltage

(x) The velocity of the crystal in Piezoelectric oscillator is :

(a)  $v = \sqrt{\rho/y}$

(b)  $v = \sqrt{y/\rho}$

(c)  $v = \rho/y$

(d)  $v = \frac{2y}{\rho}$

(Theory)

2. Attempt any *five* questions from the following :

10

- (i) Define stationary wave
- (ii) State free vibration
- (iii) Define reverberation time
- (iv) Write any *two* applications of ultrasonic waves
- (v) State Piezoelectric effect
- (vi) Write Sabine's formula
- (vii) Define absorption coefficient.

P.T.O.

3. Attempt any *two* questions from the following : 10

- (i) Obtain an expression for the differential equation of wave motion.
- (ii) Show that energy is not transferred in stationary wave.
- (iii) Explain resonance and sharpness of resonance.
- (iv) Explain Piezoelectric oscillator.

4. Attempt any *one* of the following : 10

Give the analytical treatment of stationary waves when closed end organ pipe or string fixed at the other end.

Or

- (x) Explain detection of ultrasonic waves by Kund's tube method. 5
- (y) Write a short note on requisites for good acoustics. 5

This question paper contains 8 printed pages]

**AD—349—2015**

**FACULTY OF ARTS/SCIENCE**

**B.A./B.Sc. (Second Year) (Third Semester) EXAMINATION**

**DECEMBER, 2015/JANUARY, 2016**

**(Revised Course)**

**MATHEMATICS**

**Paper VIII (MT-203)**

**(Ordinary Differential Equations)**

**(MCQ + Theory)**

**(Thursday, 7-1-2016)**

**Time : 2.00 p.m. to 4.00 p.m.**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions are compulsory.*

*(ii) First 30 minutes for Q. No. 1 and remaining time for other questions.*

*(iii) Figures to the right indicate full marks.*

*(iv) Use black ball pen to darken the circles on OMR sheet for Question No. 1.*

*(v) Negative marking system is applicable for Question*  
*P.T.O.*

## MCQ

1. Choose the correct alternative for each of the following : 10

(i) If  $r$  is such that  $r^3 = 1$  and  $r \neq 1$ , then .....

(a)  $1 - r + r^2 = 0$

(b)  $1 + r - r^2 = 0$

(c)  $1 + r + r^2 = 0$

(d)  $1 + r^2 = 0$

(ii) The solution of the differential equation  $y'' + y = 0$  is given by :

(a)  $\phi(x) = \sin x$

(b)  $\phi(x) = \cos x$

(c)  $\phi(x) = A \sin x + B \cos x$

(d) All of the above

(iii) The solution  $\phi$  of  $y' - 2y = 1$  is given by .....

(a)  $\phi(x) = \frac{1}{2} + ce^{2x}$

(b)  $\phi(x) = \frac{1}{2} + ce^{-2x}$

(c)  $\phi(x) = ce^{2x}$

(d) None of the above

- (iv) An equation  $L(y) = b(x)$  is said to be homogeneous if :
- (a)  $b(x) = 0$  for some  $x$  in  $I$
  - (b)  $b(x) = 0$  for all  $x$  in  $I$
  - (c)  $b(x) \neq 0$  for all  $x$  in  $I$
  - (d) None of the above
- (v) If  $b$  and  $c$  are any two constants, then which of the following is true ?
- (a)  $2|b||c| \leq |b|^2 + |c|^2$
  - (b)  $2|b||c| \geq |b|^2 + |c|^2$
  - (c)  $|b|^2 + |c|^2 \leq 2|b||c|$
  - (d) All of the above are true
- (vi) Two functions  $\phi_1, \phi_2$  defined on an interval  $I$  are said to be linear independent if .....
- (a) there exists two constants  $c_1, c_2$  not both zero such that  $c_1\phi_1(x) + c_2\phi_2(x) = 0$  for all  $x$  in  $I$
  - (b) there exists two constants  $c_1, c_2$  such that :  
$$c_1\phi_1(x) + c_2\phi_2(x) = 0$$
  
implies  $c_1 = 0, c_2 = 0$
  - (c) Both (a) and (b) are true
  - (d) Both (a) and (b) are false

(vii) If  $\phi_1, \phi_2$  are two solutions of  $L(y) = 0$ , then  $\phi_1\phi_2' - \phi_2\phi_1'$  is called :

- (a) Determinant of  $\phi_1, \phi_2$
- (b) Modulus of  $\phi_1, \phi_2$
- (c) Wronskian of  $\phi_1, \phi_2$
- (d) Argument of  $\phi_1, \phi_2$

(viii) The solution  $\phi(x) = 0$  of  $L(y) = 0$  is called :

- (a) Trivial solution
- (b) Non-trivial solution
- (c) Constant solution
- (d) Basic solution

(ix) If a linear space of functions contains  $n$  functions  $\phi_1, \dots, \phi_n$  which are linearly independent and such that every function in the space can be represented as a linear combination of these, then  $\phi_1, \phi_2, \dots, \phi_n$  is called .....

- (a) Linear space
- (b) Basis
- (c) Dimension
- (d) Vector space

(x) The solution  $\phi$  of equation

$$x^2y' + y = 0$$

is given by .....

(a)  $\phi(x) = \frac{1}{x}$

(b)  $\phi(x) = -\frac{1}{x}$

(c)  $\phi(x) = e^{1/x}$

(d)  $\phi(x) = e^{-1/x}$

### Theory

2. Attempt any *two* of the following :

5 marks each

(a) Consider the equation

$$y' + ay = 0$$

where  $a$  is a complex number. If  $C$  is any complex number, then show that the function  $\phi$  defined by

$$\phi(x) = ce^{-ax}$$

is a solution of this equation and moreover every solution has this form.

(b) Consider the equation :

$$y' + 5y = 2,$$

(i) Show that the function  $\phi$  given by

$$\phi(x) = \frac{2}{3} + ce^{-5x}$$

is a solution where  $c$  is a constant.

(ii) Find the solution satisfying  $\phi(1) = 2$ .

(c) Find all solutions of the following :

$$xy' + y = 3x^2 - 1.$$

3. Attempt any *two* of the following : 5 marks each

(a) If two solutions  $\phi_1, \phi_2$  of

$$L(y) = y'' + a_1y' + a_2y = 0$$

are linearly independent on an interval  $I$ , then prove that

$$W(\phi_1, \phi_2)(x) \neq 0$$

for all  $x$  and conversely.

- (b) Let  $b$  be continuous on an interval  $I$ . Show that every solution  $\psi$  of

$$L(y) = y'' + a_1y' + a_2y = b(x)$$

on  $I$  can be written as

$$\psi = \psi_p + c_1\phi_1 + c_2\phi_2,$$

where  $\psi_p$  is a particular solution,  $\phi_1, \phi_2$  are linearly independent solutions of  $L(y) = 0$  and  $c_1, c_2$  constants.

- (c) Consider the equation :

$$y'' + y' - 6y = 0$$

(i) Compute the solution  $\phi$  satisfying  $\phi(0) = 1, \phi'(0) = 0$ .

(ii) Compute the solution  $\psi$  satisfying  $\psi(0) = 1, \psi'(0) = 1$ .

4. Attempt any *two* of the following : 5 marks each

- (a) Show that there exist  $n$  linearly independent solutions of :

$$L(y) = y^{(n)} + a_1(x)y^{(n-1)} + \dots + a_n(x)y = 0$$

on an interval  $I$ .

- (b) Consider the equation :

$$y'' + \frac{1}{x}y' - \frac{1}{x^2}y = 0,$$

for  $x > 0$ . Find two linearly independent solutions of the above equation.

- (c) One solution of :

$$L(y) = y'' + \frac{1}{4x^2}y = 0$$

for  $x > 0$  is  $\phi(x) = x^{1/2}$ . Show that there is another solution  $\psi$  of the form  $\psi = u\phi$ , where  $u$  is some function.

This question paper contains 7 printed pages]

**AD—268—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**(Revised Course)**

**MATHEMATICS**

**Paper VII**

**(Group Theory)**

**(MCQ + Theory)**

**(Wednesday, 23-12-2015) Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions are compulsory.*

*(ii) First 30 minutes for Q. No. 1 and remaining time for other questions.*

*(iii) Figures to the right indicate full marks.*

*(iv) Use black ball point pen to darken the circle on OMR sheet for Q. No. 1.*

*(v) Negative marking system is applicable for Q. No. 1 (MCQ).*

**P.T.O.**

## MCQ

1. Choose the *correct* alternative for each of the following : 1 each

(i) The mapping  $\tau$  of  $S$  into  $T$  is said to be one-to-one mapping iff :

(a) whenever  $s_1 \neq s_2$ , then  $s_1\tau \neq s_2\tau$

(b) whenever  $s_1 = s_2$ , then  $s_1\tau = s_2\tau$

(c) whenever  $s_1 \neq s_2$ , then  $s_1\tau = s_2\tau$

(d) whenever  $s_1 = s_2$ , then  $s_1\tau \neq s_2\tau$

(ii) If  $a$  and  $b$  are two integers, not both zero, and if  $(a, b)$  denotes gcd of  $a$  and  $b$ , then which of the following is *true* ?

(a)  $(a, b) = (-a, b)$

(b)  $(a, b) = (a, -b)$

(c)  $(a, b) = (-a, -b)$

(d) All of the above

(iii) If  $G$  is a group,  $a \in G$ , then for any integers  $m$  and  $n$ ,  
 $a^m \cdot a^n = \dots\dots$

(a)  $a^{mn}$

(b)  $a^{m+n}$

(c)  $a^{m-n}$

(d)  $a^{m/n}$

(iv) If  $G$  is a group and  $a, b \in G$ , then  $(a \cdot b)^{-1} = ?$

(a)  $a^{-1} \cdot b^{-1}$

(b)  $b^{-1} \cdot a^{-1}$

(c)  $a \cdot b$

(d)  $b \cdot a$

(v) If  $G$  is a group and  $H$  is a subgroup of  $G$ , then for any  $a, b \in G$  when does the relation  $a \equiv b \pmod{H}$  hold :

(a)  $a \cdot b \in H$

(b)  $a^{-1} \cdot b^{-1} \in H$

(c)  $a \cdot b^{-1} \in H$

(d) All of the above

(vi) If  $P$  is a prime number and  $a$  is any integer, then which of the following always holds ?

(a)  $a^P \equiv a \pmod{P}$

(b)  $a^P \equiv 1 \pmod{P}$

(c)  $a^P \equiv 0 \pmod{P}$

(d)  $a^P \equiv P \pmod{P}$

(vii) If  $G$  is a finite group and  $N$  is a normal subgroup of  $G$ ,

then  $O\left(\frac{G}{N}\right) = ?$

(a)  $O(G) + O(N)$

(b)  $O(G) - O(N)$

(c)  $O(G) \times O(N)$

(d)  $\frac{O(G)}{O(N)}$

(viii) If  $G$  and  $\bar{G}$  are two groups and  $\phi$  is a homomorphism of  $G$  into

$\bar{G}$ , then what is kernel of  $\phi$  ?

(a)  $\{x \in G \mid \phi(x) = \bar{e}, \bar{e} = \text{identity element of } \bar{G}\}$

(b)  $\{x \in G \mid \phi(x) = x\}$

(c)  $\{x \in G \mid \phi(x) = e, e = \text{identity element of } G\}$

(d)  $\{x \in G \mid \phi(x) = x^{-1}\}$

(ix) If  $G$  is a group and  $T \in A(G)$ , then which of the following is true ?

(a)  $T$  is one-to-one

(b)  $T$  is onto

(c)  $T$  is homomorphism

(d) All of the above

(x) If  $G$  is a finite group, then for every  $a \in G$ , how are  $O(a)$  and  $O(G)$  related ?

(a)  $O(a) > O(G)$

(b)  $O(G) | O(a)$

(c)  $O(a) | O(G)$

(d) All of the above

### Theory

2. Attempt any *two* of the following : 5 each

(a) If  $\sigma : S \rightarrow T$ ,  $\tau : T \rightarrow U$  and  $\mu : U \rightarrow V$ , then prove that :

$$\sigma \circ (\tau \circ \mu) = (\sigma \circ \tau) \circ \mu.$$

(b) Let  $a, b, c$  be any integers and  $n$  be a positive integer.

If  $ab \equiv ac \pmod{n}$  and if  $a$  is relatively prime to  $n$ , then

prove that  $b \equiv c \pmod{n}$ .

(c) For  $S = \{x_1, x_2, x_3\}$  and  $\phi, \psi \in S_3$  given by :

$$\begin{array}{ll} x_1 \rightarrow x_2 & x_1 \rightarrow x_2 \\ \phi : x_2 \rightarrow x_1, \psi : x_2 \rightarrow x_3, & \\ x_3 \rightarrow x_3 & x_3 \rightarrow x_1 \end{array}$$

find  $\phi \cdot \psi$  and  $\psi \cdot \phi$ .

3. Attempt any *two* of the following : 5 each

(a) Prove that a non-empty subset  $H$  of a group  $G$  is a subgroup of  $G$  if, and only if,

(i)  $a, b \in H$  implies that  $ab \in H$

(ii)  $a \in H$  implies that  $a^{-1} \in H$ .

(b) Prove that a subgroup  $N$  of a group  $G$  is normal subgroup of  $G$  if, and only if, every left coset of  $N$  in  $G$  is a right coset of  $N$  in  $G$ .

(c) Define a normal subgroup of a group and prove that every subgroup of abelian group is normal subgroup.

4. Attempt any *two* of the following : 5 each

(a) If  $\phi$  is a homomorphism of a group  $G$  into a group  $\bar{G}$ , then

prove each of the following :

(i)  $\phi(e) = \bar{e}$ , the unit element of  $\bar{G}$

(ii)  $\phi(x^{-1}) = \phi(x)^{-1}$  for all  $x \in G$ .

(b) Prove that the kernel  $K$  of a homomorphism  $\phi$  from a group

$G$  into a group  $\bar{G}$  is a normal subgroup of  $G$ .

(c) Consider two permutations :

$$\theta = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 2 & 4 \end{pmatrix}$$

and

$$\psi = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 2 & 4 \end{pmatrix}$$

Compute  $\theta\psi$  and  $\psi\theta$ .

This question paper contains 7 printed pages]

**AD—272—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**CHEMISTRY**

**Paper VI**

**(Organic + Inorganic Chemistry)**

**(MCQ + Theory)**

**(Saturday, 26-12-2015) Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :- (i) Attempt All questions.*

*(ii) All questions carry equal marks.*

*(iii) Use separate answer-sheet (OMR sheet) for MCQ No. 1.*

**P.T.O.**

## MCQ

1. Select the *correct* answer for each of the following multiple choice questions :

(i) Benzoin is .....

(a)  $\alpha$ -hydroxy ketone

(b)  $\beta$ -hydroxy ketone

(c)  $\alpha$ -hydroxy ester

(d)  $\beta$ -hydroxy ester

(ii) The carbon atom of carbonyl group is .....

(a)  $sp$  hybridised

(b)  $sp^2$  hybridised

(c)  $sp^3$  hybridised

(d) None of the above

(iii) Anthranilic acid on heating, it gives .....

(a) Benzyl alcohol

(b) Benzoic acid

(c) Aniline

(d) None of the above

(iv) Benzene sulphonic acid on acidic hydrolysis, it gives .....

- (a) Phenol
- (b) Benzene
- (c) Aniline
- (d) Benzoic acid

(v) When methyl magnesium bromide reacts with acetaldehyde, it gives .....

- (a) 2-methyl 2-propanol
- (b) Ethanol
- (c) 1-propanol
- (d) 2-propanol

(vi) When dimethyl zinc reacts with acetyl chloride, it gives .....

- (a) 2-propanone
- (b) *t*-butyl alcohol
- (c) 2-butanone
- (d) None of the above

(vii) Natural fats and oils are the ..... of glycerol.

- (a) Diesters
- (b) Triesters
- (c) Tetraesters
- (d) None of the above

(viii) In the separation of II<sub>A</sub> and II<sub>B</sub> group basic radicals, the reagent used is :

- (a)  $\text{KMnO}_4$
- (b)  $\text{NH}_4\text{OH}$
- (c) Yellow ammonium sulphide
- (d) None of the above

(ix)  $\alpha$ -nitroso  $\beta$ -naphthol is commonly used in the analysis of .....

- (a) Cobalt
- (b) Aluminium
- (c) Copper
- (d) Nickel

(x) Which of the following is *not* protonic solvent ?

(a) HF

(b) H<sub>2</sub>O

(c) H<sub>2</sub>SO<sub>4</sub>

(d) CHCl<sub>3</sub>

### Theory

#### Section A

#### (Organic Chemistry)

2. Solve any *two* of the following :

(a) Explain Gattermann reaction with mechanism.

(b) What is action of the following on Anthranilic acid ?

(i) Heat

(ii) HNO<sub>2</sub> ?

(c) Explain Claisen condensation reaction with mechanism.

(d) What are synthetic detergents ? How are they classified ?

P.T.O.

3. Solve any *two* of the following :

- (a) Explain Knoevenagel reaction with mechanism.
- (b) What are aromatic carboxylic acids ? What is action of the following on benzoic acid :
  - (i)  $\text{HNO}_3$
  - (ii)  $\text{SOCl}_2$  ?
- (c) Offer the following reactions on ethyl acetoacetate :
  - (i)  $\text{C}_2\text{H}_5\text{ONCl}$
  - (ii)  $\text{CH}_3\text{—Br}$ .
- (d) Explain Clemmensen reduction with mechanism.

### Section B

#### (Inorganic Chemistry)

4. Answer any *two* of the following :

- (a) How will you define ?
  - (i) Qualitative analysis

- (ii) Macro analysis
  - (iii) Micro analysis
  - (iv) Semimicro analysis
  - (v) Interfering radicals ?
- (b) Explain the separation of :
- (i)  $Zn^{++}$  ions from  $Mn^{++}$  ions
  - (ii)  $Fe^{3+}$  ions from  $Al^{3+}$  ions.
- (c) Explain the following reactions in liq.  $NH_3$  medium :
- (i) Acid base reaction
  - (ii) Precipitation reaction.
- (d) (i) What is trouton's constant ?
- (ii) Explain the use of 1, 10 phenanthroline in qualitative analysis.

This question paper contains 7 printed pages]

**AD—277—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**CHEMISTRY**

**Paper VII**

**(Physical and Inorganic Chemistry)**

**(MCQ + Theory)**

**(Monday, 28-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :- (i) Attempt All questions.*

*(ii) All questions carry equal marks.*

*(iii) Use of logarithmic table and calculator is allowed.*

*(iv) Use separate answer-sheet (OMR sheet) for MCQ No. 1.*

*(v) Use black ball point pen to darken the circle of correct choice in OMR answer-sheet.*

*(vi) Darken only once circle for the answer of an MCQ.*

*(vii) Circle once darkened is final. No change is permitted.*

*(viii) Draw well labelled diagrams wherever necessary.*

**P.T.O.**

## MCQ

1. Select the *correct* answer for each of the following multiple choice questions : 10

(i) The phase rule is applicable to :

- (a) Heterogeneous systems
- (b) Homogeneous systems
- (c) Reversible systems
- (d) Irreversible systems

(ii) For a three-phase system with one component, the degree of freedom is .....

- (a) Zero
- (b) One
- (c) Two
- (d) Three

(iii) The matter has highest entropy in .....

- (a) Gaseous state
- (b) Solid state
- (c) Liquid state
- (d) None of the above

(iv) The entropy change of vaporization at constant pressure is

given by .....

(a)  $\Delta S_V = \frac{\Delta E}{\Delta T_b}$

(b)  $\Delta S_V = \frac{\Delta H_v}{\Delta T_b}$

(c)  $\Delta S_V = \frac{\Delta T_b}{\Delta H_v}$

(d)  $\Delta S_V = \frac{\Delta H_v}{T_b}$

(v) Which of the following change is observed, when Joule-Thomson coefficient ( $\mu_{JT}$ ) is positive ?

- (a) Cooling effect on expansion
- (b) Warming effect on expansion
- (c) Ideal behaviour
- (d) None of the above

(vi) Schrodinger's wave equation is :

- (a) First order differential equation
- (b) Second order differential equation
- (c) Third order differential equation
- (d) None of the above

- (vii) Photoelectric effect was explained by .....
- (a) Compton W.H.
  - (b) Max Planck
  - (c) Heisenberg
  - (d) Albert Einstein
- (viii)  ${}_8\text{O}^{16}$ ,  ${}_8\text{O}^{17}$ ,  ${}_8\text{O}^{18}$  are examples of :
- (a) Isotopes
  - (b) Isobars
  - (c) Isotones
  - (d) None of the above
- (ix) When radioactive isotope emits one  $\alpha$  particle its :
- (a) Daughter element shifts two positions left to parent element
  - (b) Daughter element shifts two positions right to parent element
  - (c) Daughter element shifts one position left to parent element
  - (d) None of the above

- (x) Digestion is essential step in Gravimetric analysis because :
- (a) It increases particle size
  - (b) It decreases particle size
  - (c) Particle size remains same
  - (d) None of the above

### Theory

#### Section 'A'

#### (Physical Chemistry)

2. Answer any *two* of the following :
- (a) Explain Davisson-Germer experiment for the evidence of wave nature of matter.
  - (b) State Carnot theorem. Calculate the maximum efficiency in percentage of an engine operating between  $110^{\circ}\text{C}$  and  $25^{\circ}\text{C}$ .
  - (c) Derive an expression for entropy change for an ideal gas as a function of volume and temperature.
  - (d) Draw a phase diagram of Pb-Ag system. Mention eutectic mixture and temperature. Explain desilverisation of lead.

P.T.O.

3. Answer any *two* of the following :

(a) A photon of wavelength  $2000 \text{ \AA}$  strikes a potassium metal. The work function of the metal is  $1.6 \text{ eV}$ . Calculate the kinetic energy of the emitted electrons. ( $h = 6.626 \times 10^{-34} \text{ Js}$ ).

(b) (i) Explain Compton effect.

(ii) Draw a neat well labelled diagram of  $\text{CO}_2$  system. Mention triple point and curves.

(c) What is the effect of impurity on critical solution temperature (CST) ? Define :

(i) Partially miscible liquids

(ii) Critical solution temperature

(iii) Upper critical solution temperature.

(d) (i) Calculate the entropy change when one mole of ethanol is evaporated at  $305 \text{ K}$ , the molar heat of vaporisation of ethanol is  $37.77 \text{ kJ mol}^{-1}$ .

- (ii) Calculate the entropy change when two mole of an ideal gas is allowed to expand isothermally at 304 K from pressure 50 atmosphere to a pressure of 5 atmosphere.

$$(R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}).$$

**Section 'B'**

**(Inorganic Chemistry)**

4. Answer any *two* of the following :

- (a) What is mass defect ? Calculate binding energy per nucleon of  ${}^4_2\text{He}$  which has mass 4.00260 amu.

(Given : Mass of neutron = 1.008665 amu

Mass of proton = 1.007278 amu

Mass of electron = 0.00055 amu).

- (b) Explain any *five* applications of radioactive isotopes.

- (c) Explain the importance of digestion, filtration and washing in gravimetric analysis.

- (d) (i) Write a note on hydrogen bomb.

- (ii) What is ignition and incineration ? Explain.

This question paper contains 4+2 printed pages]

**AD—316—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Third Semester) EXAMINATION**

**DECEMBER, 2015/JANUARY, 2016**

**PHYSICS**

**Paper VII**

**(Statistical Physics, Electromagnetic Theory and Relativity)**

**(MCQ + Theory)**

**(Friday, 1-1-2016)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) Attempt All questions.*

*(ii) Question No. 1 is MCQ type. Answer MCQ's on OMR sheet only.*

*(iii) Question Nos. 2, 3 and 4 are descriptive type questions.*

*(iv) Use separate answer-book/sheet for MCQ type questions and descriptive type questions.*

*(v) Negative marking system is applicable to MCQ examination.*

**P.T.O.**

## (MCQ)

1. Attempt all multiple choice questions. 10
- (i) If a coin is tossed 60 times and in 20 of them the coin shows heads, the frequency of this event is :
- (A) 3
  - (B) 0.33
  - (C) 0.37
  - (D) 0.73
- (ii) The macrostates which are allowed under a constraint are called .....
- (A) Accessible macrostates
  - (B) Accessible microstates
  - (C) Inaccessible macrostates
  - (D) Inaccessible microstates
- (iii) The unit of phase-space volume is .....
- (A) Joule-sec
  - (B) Joule
  - (C) (Joule-sec)<sup>2</sup>
  - (D) (Joule-sec)<sup>3</sup>

(iv) Antisymmetric particles in Fermi-Dirac Statistics are known as .....

(A) Fermions

(B) Electrons

(C) Boson

(D) Neutrons

(v) The direction of Poynting vector gives :

(A) Direction of electric field

(B) Direction of propagation of EM wave

(C) Direction of magnetic field

(D) Both (A) and (C)

(vi) In Bose-Einstein number of distinguishable ways are given by .....

(A) 
$$W = \prod_i^N \frac{g_i^{n_i}}{n_i!}$$

(B) 
$$W = \prod_i \frac{g_i!}{n_i!(g_i - n_i)!}$$

(C) 
$$W = \prod_i \frac{(n_i + g_i - 1)!}{n_i!(g_i - 1)!}$$

(D) 
$$W = \prod_i \frac{g_i!}{n_i!(g_i + n_i)!}$$

(vii) The Maxwell equation  $\nabla \cdot D = \rho$  .....

- (A) Gauss's law derived from Coulomb law
- (B) Farady's law derived from Coulomb law
- (C) Ampere's law derived from Coulomb law
- (D) Lenz's law derived from Coulomb law

(viii) According to Lorentz transformation equations  $x' =$  .....

(A)  $\frac{X + Vt}{\sqrt{1 - V^2/C^2}}$

(B)  $\frac{X - Vt}{\sqrt{1 + V^2/C^2}}$

(C)  $\frac{X + Vt}{\sqrt{1 + V^2/C^2}}$

(D)  $\frac{X - Vt}{\sqrt{1 - V^2/C^2}}$

(ix) The universal equivalence between mass and energy is given by the equation .....

(A)  $E = mc$

(B)  $E = m^2c$

(C)  $E = \sqrt{mc}$

(D)  $E = mc^2$

(x) According to Galilean transformation ..... is invariant.

- (A) Velocity
- (B) Acceleration
- (C) Inertia
- (D) Momentum

(Theory)

2. Attempt any *five* of the following questions :

10

- (i) Define the term microstates and macrostates.
- (ii) Define the probability. When will the probability be zero ?
- (iii) Write the equation for maximum probability distribution in Fermi-Dirac.
- (iv) What is Electron Gas ?
- (v) State Ampere's law.
- (vi) State Poynting Vector.
- (vii) Write the postulates of special theory of Relativity.

P.T.O.

3. Attempt any *two* of the following questions ; 10

- (i) Explain thermodynamic probability.
- (ii) Write a note on Photon gas.
- (iii) Explain the wave equation in terms of free space.
- (iv) Write a note on addition of velocity.

4. Attempt any *one* of the following questions : 10

- (i) Derive an expression for Fermi-Dirac distribution law.
- (ii) Obtain an expression for relativistic variation of mass with velocity.

This question paper contains 4+2 printed pages]

**AD—313—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**ZOOLOGY**

**Paper VI**

**(Genetics)**

**(MCQ and Theory)**

**(Thursday, 31-12-2015) Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

- N.B. :-* (i) All questions are compulsory.  
(ii) Draw neat and labelled diagrams wherever necessary.  
(iii) All questions carry equal marks.

**(MCQ)**

1. Select the correct answer from the given multiple choice questions. 10
- (i) The term Genetics was coined by .....
- (A) Correns  
(B) William Bateson  
(C) Teschermark  
(D) Mendel

P.T.O.

(ii) The character which appears in  $F_1$  generation is called as .....

- (A) Dominant character
- (B) Recessive character
- (C) Aggressive character
- (D) Prominant character

(iii) The skin pigmentation in man is an example of .....

- (A) Codogenes
- (B) Ancogenes
- (C) Multiple genes
- (D) Incomplete dominance

(iv) The phenomenon of crossing over involved in the formation of .....

- (A) Duplicate genes
- (B) Interaction of genes
- (C) Multiple genes
- (D) Recombination of genes

- (v) Chiasma means .....
- (A) Cross
  - (B) Joint
  - (C) Break
  - (D) Fushion
- (vi) The person suffering from colour blindness can not differenciate .....
- ..... colours.
- (A) Red and green
  - (B) White and blue
  - (C) Black and yellow
  - (D) None of the above
- (vii) The Haemophilia is called as .....
- (A) Bleeder's disease
  - (B) Royal disease
  - (C) Both (a) and (b)
  - (D) Protanopia

(viii) The sudden, abrupt and inheritable changes in genes and chromosomes are called as .....

- (A) Adaptations
- (B) Variations
- (C) Mutations
- (D) Modifications

(ix) The person of albinism is called as .....

- (A) Critin
- (B) Albinos
- (C) Idiots
- (D) Carriers

(x) The 'okazaki' segments are joined together by enzyme .....

- (A) DNA—polymerase
- (B) DNA—ligase
- (C) RNA—polymerase
- (D) Endonuclease

## (Theory)

2. Describe Mendel's laws of independent assortment with a suitable example. 10

Or

Write short notes on :

- (a) Back cross  
(b) DNA duplication.

3. Define linkage. Explain complete linkage in *Drosophila*. 10

Or

Write short notes on :

- (a) Erythroblastosis foetalis  
(b) Genetic code.

4. What is sex linked inheritance ? Explain it with reference to colour blindness. 10

Or

Write short notes on :

- (a) Significance of crossing over.  
(b) Klinefelter's syndrome.

This question paper contains 4+1 printed pages]

**AD—317—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Third Semester) EXAMINATION**

**DECEMBER, 2015/JANUARY, 2016**

**ZOOLOGY**

**Paper VII**

**(Comparative Anatomy and Physiology)**

**(MCQ and Theory)**

**(Friday, 1-1-2016)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—2 Hours*

*Maximum Marks—40*

- N.B. :—*
- (i) All questions are compulsory.
  - (ii) Use separate answer sheet (OMR) for question No. 1.
  - (iii) Draw well-labelled diagrammes wherever necessary.
  - (iv) All questions carry equal marks.

**(MCQ)**

1. Select the *correct* answer from the given multiple choice.

(i) Teeth are derivatives of .....

- (A) Epidermis of skin
- (B) Dermis of skin
- (C) Bone of Jaws skeleton
- (D) None of the above

P.T.O.

- (ii) Metanephric kidney is found in .....
- (A) Reptiles only
  - (B) Birds only
  - (C) Mammals only
  - (D) All of the above
- (iii) Lock and key hypothesis of enzyme action was proposed by .....
- (A) Emile Fisher
  - (B) Koshland
  - (C) Krebs
  - (D) Mentan
- (iv) Vitamin D deficiency in adult causes .....
- (A) Rickets
  - (B) Osteomalacia
  - (C) Pellagra
  - (D) Scurvy

(v) Digestion of protein occurs in .....

- (A) Buccal cavity and stomach
- (B) Intestine and buccal cavity
- (C) Stomach and intestine
- (D) Stomach and oesophagus

(vi) In a normal adult man, the blood pressure is .....

- (A) 120/80 mm. Hg.
- (B) 100/80 mm. Hg.
- (C) 100/20 mm. Hg.
- (D) 100/100 mm. Hg.

(vii) Gills are the respiratory organs of .....

- (A) Birds
- (B) Man
- (C) Fishes
- (D) Reptiles

- (viii) The animals excrete the excretory product in the form of ammonia are called as .....
- (A) Ammonotelic
  - (B) Ureotelic
  - (C) Uricotelic
  - (D) Purinotelic
- (ix) The junction between two neurons is called .....
- (A) Synaptic knob
  - (B) Synapse
  - (C) Axon
  - (D) Dendron
- (x) Skeletal muscles are .....
- (A) Voluntary
  - (B) Involuntary
  - (C) Both (a) and (b)
  - (D) None of the above

**(Theory)**

2. Give an account on comparative anatomy of heart of vertebrates.

*Or*

Write notes on :

- (a) Reptilian skin
  - (b) Smooth muscles.
3. Give a detailed account on sources, deficiency diseases and effects of fat soluble vitamins.

*Or*

Write notes on :

- (a) Carbohydrate digestion
  - (b) Structure of uniferous tubules.
4. Give a detailed account on composition and functions of blood.

*Or*

Write notes on :

- (a) Mechanism of respiration
- (b) Conduction of nerve impulse.

This question paper contains 4+2 printed pages]

**AD—262—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**(Revised Course)**

**BOTANY**

**Paper VI**

**(Morphology and Taxonomy of Angiosperms)**

**(MCQ + Theory)**

**(Tuesday, 22-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions are compulsory.*

*(ii) All questions carry equal marks.*

*(iii) Choose appropriate answer from MCQ.*

*(iv) Draw neat and well labelled diagrams wherever necessary.*

**P.T.O.**

## MCQ

## 1. Multiple choice questions :

10

(i) Pedicel is the stalk of .....

- (a) Leaf
- (b) Inflorescence
- (c) Flower
- (d) Anther

(ii) Rhizome is a modification of .....

- (a) Underground stem
- (b) Aerial stem
- (c) Sub-aerial stem
- (d) Root

(iii) Bentham and Hooker's system of plant classification published in .....

- (a) Genera Plantarum
- (b) Species Plantarum
- (c) Die Naturlichen
- (d) Flora Lapponica

- (iv) The system of designating every organism by two names is called .....
- (a) Nomenclature
  - (b) Binomial nomenclature
  - (c) Polynomial nomenclature
  - (d) None of the above
- (v) The stamens of Malvaceae are .....
- (a) Monoadelphous
  - (b) Diadelphous
  - (c) Staminode
  - (d) Sterile
- (vi) Type of fruit in *Coriandrum sativum* is .....
- (a) Caryopsis
  - (b) Legume
  - (c) Cremocarp
  - (d) Sorosis

(vii) The marginal placentation occurs in .....

- (a) Malvaceae
- (b) Annonaceae
- (c) Brassicaceae
- (d) Caesalpinaceae

(viii) Calyx are modified into hairy or scaly structure in Asteraceae called as .....

- (a) Bract
- (b) Pappus
- (c) Trichomes
- (d) Bracteoles

(ix) Persistent calyx presents in .....

- (a) Poaceae
- (b) Liliaceae
- (c) Annonaceae
- (d) Solanaceae

(x) Perianth is reduced to scales which is hyaline or fleshy called .....

(a) Bract

(b) Lodicules

(c) Stipules

(d) Bracteoles

#### Theory

2. Describe in detail types of classification of Angiosperms. 10

Or

Write short notes on :

(a) Structure of *Hibiscus* flower

(b) Scope and objectives of taxonomy.

3. Describe the general characters of family Annonaceae. Give its floral formula and floral diagram. 10

Or

Write short notes on :

(a) Types of phyllotaxy

(b) Floral morphology of Meliaceae.

P.T.O.

4. Describe the general characters of family Euphorbiaceae. Give its floral formula and floral diagram. 10

*Or*

Write short notes on :

- (a) Types of fruit
- (b) Economic importance of Poaceae.

This question paper contains 7 printed pages]

**AD—264—2015**

**FACULTY OF ARTS/SCIENCE**

**B.A./B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**(Revised Course)**

**MATHEMATICS**

**Paper VI**

**(Real Analysis—I)**

**(MCQ + Theory)**

**(Tuesday, 22-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions are compulsory.*

*(ii) First 30 minutes are for Q.No. 1 (MCQ) and remaining time for other questions.*

*(iii) Figures to the right indicate full marks.*

*(iv) Use black ball point pen to darken the circle of correct choice in OMR answer-sheet.*

*(v) Negative marking system is applicable for MCQ.*

**P.T.O.**

## MCQ

1. Choose the *correct* alternative for each of the following : 10

(i) Let :

$$f(x) = \log x \quad (0 < x < \infty)$$

Then the range of  $f(x)$  is :

(a)  $(0, \infty)$

(b)  $(-\infty, 0)$

(c)  $(-\infty, \infty)$

(d)  $(0, 1)$

(ii) If  $a, b$  are real numbers, then  $\min(a, b) = \dots\dots\dots$

(a)  $\frac{|a-b| + a + b}{2}$

(b)  $\frac{|a-b| - a - b}{2}$

(c)  $\frac{-|a-b| - a - b}{2}$

(d)  $\frac{-|a-b| + a + b}{2}$

(iii) The binary expansion of  $\frac{1}{16}$  is  $\dots\dots\dots$

(a) 0.0010.....

(b) 0.00010.....

(c) 0.0100.....

(d) 0.000010.....

(iv) Let  $\{S_n\}_{n=1}^{\infty}$  be the sequence defined by :

$$S_1 = 1, S_2 = 1, S_{n+1} = S_n + S_{n-1}$$

then  $S_8 = \dots\dots\dots$

- (a) 21
- (b) 13
- (c) 34
- (d) 25

(v) Let  $\{S_n\}_{n=1}^{\infty}$  be a sequence of real numbers. Then  $\{S_n\}$  is non-increasing if :

- (a)  $S_1 \leq S_2 \leq S_3 \leq \dots \leq S_n \leq S_{n+1} \leq \dots$
- (b)  $S_1 \geq S_2 \geq S_3 \geq \dots \geq S_n \geq S_{n+1} \geq \dots$
- (c)  $S_1 = S_2 = S_3 = \dots = S_n = S_{n+1} = \dots$
- (d)  $S_n \rightarrow 0$  as  $n \rightarrow \infty$

(vi)  $\lim_{n \rightarrow \infty} \frac{3n^2 - 6n}{5n^2 + 4} = \dots\dots\dots$

- (a)  $\frac{5}{3}$
- (b) 5
- (c) 3
- (d)  $\frac{3}{5}$

(vii) If  $x \geq 1$ , then :

$$\sum_{n=1}^{\infty} x^n \dots\dots\dots$$

- (a) diverges
- (b) converges
- (c) oscillates
- (d) tends to zero

(viii) Let  $\sum_{n=1}^{\infty} a_n$  be a series of real numbers. If  $\sum_{n=1}^{\infty} a_n$  converges but

$\sum_{n=1}^{\infty} |a_n|$  diverges, then we say that  $\sum_{n=1}^{\infty} a_n$  .....

- (a) Converges absolutely
- (b) Diverges absolutely
- (c) Converges conditionally
- (d) Diverges conditionally

(ix) If :

$$\lim \sup_{n \rightarrow \infty} \sqrt[n]{|a_n|} = A$$

then the series of real numbers  $\sum_{n=1}^{\infty} a_n$  diverges if :

- (a)  $A < 1$
- (b)  $A > 1$
- (c)  $A = 1$
- (d)  $A = 0$

(x) If for some  $x \in \mathbb{R}$  the power series  $\sum_{n=0}^{\infty} a_n x^n$  and  $\sum_{n=0}^{\infty} b_n x^n$  are

absolutely convergent, then :

$$\left( \sum_{n=0}^{\infty} a_n x^n \right) \left( \sum_{n=0}^{\infty} b_n x^n \right) = \sum_{n=0}^{\infty} c_n x^n$$

where  $c_n = \dots\dots\dots$

- (a)  $\sum_{k=0}^n a_k b_k$
- (b)  $\sum_{k=0}^n a_n b_n$
- (c)  $\sum_{k=0}^n a_{n-k} b_k$
- (d)  $\sum_{n=0}^{\infty} a_k b_{n-k}$

**Theory**

2. Attempt any *two* of the following : 5 each

- (a) If  $A_1, A_2, A_3, \dots$  are countable sets, then prove that :

$$\bigcup_{n=1}^{\infty} A_n$$

is countable.

- (b) If  $A$  is any non-empty subset of  $\mathbb{R}$  that is bounded below, then prove that  $A$  has a greatest lower bound in  $\mathbb{R}$ .

- (c) If :

$$f(x) = 1 + \sin x \quad (-\infty < x < \infty)$$

$$g(x) = x^2 \quad (0 \leq x < \infty)$$

then find  $g \circ f(x)$ .

3. Attempt any *two* of the following : 5 each

- (a) If  $\{S_n\}_{n=1}^{\infty}$  is a sequence of non-negative numbers and if

$$\lim_{n \rightarrow \infty} S_n = L, \text{ then prove that } L \geq 0.$$

- (b) If the sequence of real numbers  $\{S_n\}_{n=1}^{\infty}$  converges, then prove that  $\{S_n\}_{n=1}^{\infty}$  is a Cauchy sequence.

(c) Find  $N \in \mathbb{I}$  such that :

$$\left| \frac{2n}{n+3} - 2 \right| < \frac{1}{5} \quad (n \geq N)$$

4. Attempt any two of the following :

5 each

(a) If  $\sum_{n=1}^{\infty} a_n$  is convergent series, then prove that :

$$\lim_{n \rightarrow \infty} a_n = 0.$$

(b) Let  $\sum_{n=1}^{\infty} a_n$  be a series of non-zero real numbers and let :

$$a = \liminf_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|, \quad A = \limsup_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|$$

If  $A < 1$ , then prove that :

$$\sum_{n=1}^{\infty} |a_n| < \infty.$$

(c) Prove that the series  $\sum_{n=1}^{\infty} \left( \frac{1}{n} \right)$  is divergent.

This question paper contains 4+2 printed pages]

**AD—267—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**BOTANY**

**Paper VII**

**(Histology, Anatomy and Embryology of Angiosperms)**

**(MCQ + Theory)**

**(Wednesday, 23-12-2015) Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :- (i) Attempt All questions.*

*(ii) All questions carry equal marks.*

*(iii) Choose the correct answer for MCQ.*

**P.T.O.**

## MCQ

## 1. Multiple Choice Questions :

10

(i) Apical cell theory is proposed by .....

(a) Nageli

(b) Hanstein

(c) Schmidt

(d) Schueep

(ii) Histogen theory is proposed by .....

(a) Nageli

(b) Hanstein

(c) Schmidt

(d) Schueep

(iii) Phloem consists of .....

(a) Sieve tubes

(b) Companion cells

(c) Phloem parenchyma

(d) All of the above

(iv) Hydathode is also called as .....

(a) Water stomata

(b) Resin ducts

(c) Oil glands

(d) Latex cells

(v) The casparian bands are found in .....

(a) Cambium

(b) Phloem

(c) Endodermis

(d) Phellogen

(vi) Radial vascular bundles are found in .....

(a) Monocot leaf

(b) Monocot stem

(c) Dicot Root

(d) Petiole

(vii) When the pollen tube enters into the ovule through chalaza,

the condition is known as .....

(a) Chalazogamy

(b) Porogamy

(c) Mesogamy

(d) All of the above

(viii) The ovule without integuments is called .....

(a) Ategmic

(b) Bitegmic

(c) Tritegmic

(d) All of the above

(ix) After fertilization seeds are developed from .....

(a) Endosperm

(b) Ovule

(c) Ovary

(d) Integuments

- (x) The seed with endosperm is called as .....
- (a) Endospermic
  - (b) Non-endospermic
  - (c) Perispermic
  - (d) None of the above

**Theory**

2. What is Meristem ? Describe the classification of meristem. 10

*Or*

Write short notes on :

- (a) Xylem
  - (b) Laticiferous tissue.
3. Write in detail normal secondary growth in sunflower root. 10

*Or*

Write short notes on :

- (a) T.S. of maize stem
- (b) Types of vascular bundles.

4. What is Endosperm ? Write in detail nuclear endosperm. 10

*Or*

Write short notes on :

- (a) Anatropous ovule.
- (b) Germination of pollen grain.

This question paper contains 4 printed pages]

**AD—351—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**DECEMBER, 2015/JANUARY, 2016**

**COMPUTER SCIENCE**

**Paper VII**

**(Object Oriented Programming Using C++)**

**(MCQ and Theory)**

**(Saturday, 9-1-2016) Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions carry equal marks.*

*(ii) Figures to the right indicate full marks.*

*(iii) Assume suitable data if necessary.*

**(MCQ)**

**1. Attempt the following :**

**10**

*(i) ..... is data type in C++.*

**(A) integer**

**(B) inte**

**(C) int**

**(D) string**

**P.T.O.**

(ii) ..... is not operator in C++.

- (A) <
- (B) >
- (C) < >
- (D) !=

(iii) ..... is called as scope resolution operator.

- (A) ::
- (B) <<
- (C) >>
- (D) Scope

(iv) Object is variable whose data type is .....

- (A) int
- (B) class
- (C) float
- (D) char

(v) ..... is automatically accessed when you create object of class.

- (A) function
- (B) constructor
- (C) data
- (D) private member

(vi) ..... is not type of inheritance.

- (A) Single
- (B) Multiple
- (C) Hybrid
- (D) Complex

(vii) ..... is input statement in C++.

- (A) cin
- (B) cinput
- (C) input
- (D) ip

(viii) ..... is visibility mode in C++.

- (A) complex
- (B) protected
- (C) line
- (D) link

(ix) ..... is looping statement in C++.

- (A) for
- (B) if
- (C) switch
- (D) break

(x) C++ is ..... oriented programming language.

- (A) object
- (B) constructor
- (C) operator
- (D) data type

(Theory)

2. Explain the following control statements with syntax and example : 10

- (a) For loop
- (b) While loop.

Or

- (a) Explain concept of constructor in detail. 5
- (b) Write a C++ program to display Fibonacci series. 5

3. What is inheritance ? What are the different types of inheritance ? 10

Or

- (a) Explain concept of operator overloading. 5
- (b) Write a program to describe function overloading. 5

4. Explain friend function with example program. 10

Or

- (a) Discuss rules for overloading operators. 5
- (b) Explain procedure for storing data into file. 5

This question paper contains 4+2 printed pages]

**AD—231—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**MICROBIOLOGY**

**Paper VI**

**(Applied Microbiology)**

**(MCQ + Theory)**

**(Thursday, 17-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :- (i) Attempt All questions.*

*(ii) All questions carry equal marks.*

*(iii) Draw well labelled diagrams wherever necessary.*

**P.T.O.**

## MCQ

1. Select the *correct* answer for each of the following multiple choice questions : 10×1=10

(i) Ultrathin dried mucosal particle suspended in air is .....

- (a) Aerosole
- (b) Droplet
- (c) Droplet nuclei
- (d) Biosole

(ii) ..... is a air borne disease.

- (a) Cholera
- (b) Influenza
- (c) Typhoid
- (d) Dysentery

(iii) ..... is also used as index of fecal contamination of water.

- (a) *Streptococcus lactis*
- (b) *Streptococcus fecalis*
- (c) *Staphylococcus aureus*
- (d) *Cl. tetani*

- (iv) Significant microorganism in trickling filter is .....
- (a) *Zymomonas mobilis*
  - (b) *Zoogloea ragimera*
  - (c) *Rhizobium*
  - (d) *Pseudomonas*
- (v) Medium used in presumptive test is .....
- (a) Boric acid Lactose bile broth
  - (b) Brilliant green lactose bile broth
  - (c) Lactose bile broth
  - (d) Lactose broth
- (vi) ..... is used as index of pasteurization.
- (a) *Mycobacterium tuberculosis*
  - (b) *Coxiella burnetii*
  - (c) *Bacillus subtilis*
  - (d) *Clostridium perfrengins*

(vii) ..... is used for determination of efficiency of pasteurization.

- (a) Resazurin test
- (b) Eijackman test
- (c) Phosphatase test
- (d) MBRT test

(viii) ..... is important bacterial genera for production of fermented milk product.

- (a) *Lactobacillus*
- (b) *Pseudomonas*
- (c) *Staphylococcus*
- (d) *Bacillus*

(ix) In LTH method of pasteurization time-temperature relationship is .....

- (a) 60°C for 15 min.
- (b) 62.8°C for 30 min.
- (c) 71.7°C for 15 sec.
- (d) 62°C for 15 sec.

(x) ..... is a milk borne disease.

(a) *Brucellosis*

(b) Typhoid

(c) Swine flu

(d) Actinomycosis

### Theory

2. Describe solid impaction and liquid impingement method for microbiological analysis of air. 10

*Or*

(a) Discuss in brief sources of microorganisms in water. 5

(b) Write a note on MPN. 5

3. Represent the municipal sewage treatment process. Describe in brief biological treatment. 10

*Or*

Write notes on :

(a) MBRT 5

(b) Milk borne diseases. 5

P.T.O.

4. Describe sources of microorganisms in air. 10

Or

Write on :

(a) IMVic Test 5

(b) Imhoff Tank. 5

This question paper contains 4+2 printed pages]

**AD—237—2015**

**FACULTY OF SCIENCE**

**B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**MICROBIOLOGY**

**Paper VII**

**(Immunology)**

**(MCQ + Theory)**

**(Friday, 18-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions are compulsory.*

*(ii) Attempt MCQs on OMR answer-sheet separately.*

*(iii) Draw well-labelled diagram wherever necessary.*

**MCQ**

1. Multiple choice questions :

10

(i) Precipitation reaction is sensitive for detection of .....

(a) Antigen

(b) Antibody

(c) Both (a) and (b)

(d) All of the above

P.T.O.

(ii) Which of the following is an example of biological vector in malaria transmission ?

(a) House fly

(b) Mosquito

(c) Lice

(d) Mites

(iii) Immunoglobulin molecule present in sero-mucous secretions is :

(a) IgA

(b) SIgA

(c) IgD

(d) IgM

(iv) The half life period of IgM is :

(a) 23 days

(b) 2.3 days

(c) 32 days

(d) 5 days

(v) Antihuman Immunoglobulin test is also called as :

- (a) CFT
- (b) Neutrilization test
- (c) Coomb's test
- (d) RIA

(vi) Lattic hypothesis was proposed by :

- (a) Burnet
- (b) Louis Pasteur
- (c) Marrack
- (d) Pauling

(vii) Which amongst the following is well accepted theory for antibody formation ?

- (a) Side chain theory
- (b) Templet theory
- (c) Instructive theory
- (d) Clonal selection theory

(viii) Type I hypersensitive reaction is mediated by :

- (a) Reagenic antibody
- (b) IgE
- (c) Both (a) and (b)
- (d) IgD

(ix) The following are the antigens associated with *Salmonella typhi* :

- (a) H, O, P
- (b) H, O, K
- (c) H, O, Vi
- (d) Vi, K, O

(x) Which antibody is predominantly synthesised during secondary Immune response ?

- (a) IgA
- (b) IgG
- (c) IgD
- (d) IgM

**Theory**

2. Define infection. Explain in detail different sources of infection. 10

*Or*

(a) Differentiate between Endotoxin and Exotoxins. 5

(b) Differentiate between Active and Passive immunity. 5

3. Define antigen. Write on attributes on antigen and explain general properties of antigen. 10

*Or*

(a) What are antibodies ? Explain basic structure of Immunoglobulin. 5

(b) Write a note on Antibody mediated immune response. 5

4. What are serological reactions ? Explain agglutination reaction with mechanism. 10

P.T.O.

Or

Write notes on :

- (a) Classification of Hypersensitivity 5
- (b) Complement fixation test. 5

This question paper contains 4+2 printed pages]

**P—436—2015**

**FACULTIES OF ARTS/SCIENCE/COMMERCE  
B.A./B.Sc./B.Com. (Third Semester) EXAMINATION  
NOVEMBER/DECEMBER, 2015**

**ENGLISH**

(Compulsory English)

(MCQ+Theory)

**(Monday, 21-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :— (i) All questions are compulsory.*

*(ii) Figures to the right indicate full marks.*

**(MCQ)**

1. Solve the following Multiple Choice Questions : 10
- (i) What was the problem of a young man in a garret ?
- (a) He was too cold to write any more
- (b) There was no fire in the grate
- (c) Hunger has made him faint
- (d) All of the above
- (ii) Guy De Maupassant was ..... short story writer and novelist.
- (a) a Russian
- (b) an American
- (c) an Irish
- (d) a French

P.T.O.

- (iii) The necklace that Mathilde and Mr. Loisel bought to replace the lost necklace cost them .....
- (a) Forty thousand Francs
  - (b) Thirty-four thousand Francs
  - (c) Thirty-six thousand Francs
  - (d) Thirty-eight thousand Francs
- (iv) According to Plato, the organisation of society depends ultimately upon .....
- (a) Knowledge of the principles of democracy
  - (b) Knowledge of the worth of individual freedom
  - (c) Knowledge of the end of existence
  - (d) Knowledge of the dangers of chaos
- (v) The condition that the chief laid out for selling the land to Pahom was that .....
- (a) He would have to return the land when the chief demanded it
  - (b) Pahom would have to return on the same day to the spot from where he started
  - (c) Pahom could not have the land for more than ten years
  - (d) Pahom could walk only till the point marked by the chief

- (vi) Sue and Johnsy are .....
- (a) evangelists
  - (b) actors
  - (c) artists
  - (d) orators
- (vii) The main reason behind the discords associated with gift giving is that .....
- (a) there is no commensurability between the act of giving and the gift
  - (b) there is no commensurability between the value of a gift and an occasion
  - (c) there is no commensurability between a man and any gift
  - (d) there is no commensurability between an occasion and any gift
- (viii) The legend has that the mulberry tree near which Pyramus and Thisbe ended their lives .....
- (a) never flowered again
  - (b) had purple berries
  - (c) was cut down by semiramis
  - (d) was found uprooted the next day

- (ix) Mr. Loisel was .....
- (a) a minister in the Department of Education
  - (b) a clerk in the Department of Education
  - (c) an officer in the Department of Education
  - (d) a clerk in the Department of Defence
- (x) Sue saw Johnsy counting the falling ivy leaves and Johnsy told her that .....
- (a) when the last leaf falls she will also die
  - (b) when the tree is bare she will start a new life
  - (c) when the last leaf falls she will get better
  - (d) when the last leaf falls Sue will have to paint the tree

(Theory)

2. Explain with reference to the context any *one* of the following :

4

- (i) We must see how we can replace those jewels.
- (ii) They're falling faster now. Three days ago there were almost a hundred. It made my head ache to count them. But now it's easy. There goes another one. There are only five left only.

3. Narrate the short story 'The Happy Prince' in your own words. 8

Or

Examine Pahom's state of mind as he moves from being a peasant to becoming a landowner.

4. Write short answers of the following questions (any two) : 8
- (i) Why does G.B. Shaw think that 'when the speaker is a foreigner, the better he speaks, the harder it is to understand him' ?
  - (ii) What according to Ambedkar is 'graded inequality' ?
  - (iii) Who are Pyramus and Thisbe ?
  - (iv) Why do we find it difficult to receive gifts according to Emerson ?
5. (a) Give the meaning of the following idioms and phrases (any five) : 5
- (i) at the crack of dawn.
  - (ii) fast and furious
  - (iii) a stumbling block
  - (iv) neck and neck
  - (v) a list as long as your arm
  - (vi) cool, calm and collected
  - (vii) back to square one.

P.T.O.

(b) Rewrite the following sentences into indirect speech (any five) :

5

- (i) Anil says, "Priya is working in Ahmedabad."
- (ii) Kapil said, "The bell rings at 10 a.m."
- (iii) Ajay said, "I saw a movie."
- (iv) Asha said, "Nisha can come to attend the function."
- (v) I said to her, "Will you teach me English ?"
- (vi) Brijesh said to us, "Let us go to see the temple."
- (vii) He said, "What a beautiful sight it is !"

This question paper contains 4 printed pages]

**P—428—2015**

**FACULTIES OF ARTS/COMMERCE/SCIENCE**

**B.A./B.Com./B.Sc. (Second Year) (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**MARATHI (Second Language)**

(साहित्यधारा भाग—I)

(MCQ + Theory)

**(Saturday, 19-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

*N.B. :- (i) सर्व प्रश्न सोडविणे अनिवार्य आहेत.*

*(ii) सर्व प्रश्नांना समान गुण आहेत.*

**MCQ**

1. खालील वस्तुनिष्ठ प्रश्न सोडवा :

10

(i) “काय करणारे ? कुणबटाचं लेकरू दुसरं काय करणार सर ? हये नव्हं का भाजीपाला विकतोय.” असे कोण म्हणाला ?

(a) यशवंता

(b) सिरपती

(c) दामू

(d) भास्कर

P.T.O.

- (ii) ताराबाई शिंदे या ..... येथिल रहिवासी होत्या.
- (a) नागपूर  
(b) जळगाव  
(c) अमरावती  
(d) बुलढाणा
- (iii) दिवाकर यांनी ..... नाट्यछटा लिहिल्या.
- (a) 50  
(b) 51  
(c) 61  
(d) 71
- (iv) 'शिवाजी कोण होता' हा ग्रंथ ..... यांचा आहे.
- (a) वसंत कानेटकर  
(b) कॉ. गोविंद पानसरे  
(c) डॉ. आ.ह. साळुंखे  
(d) रणजीत देसाई
- (v) 'तंट्या' या कादंबरीचे लेखक कोण आहेत ?
- (a) बाबा भांड  
(b) यशवंत मनोहर  
(c) बाबाराव मुसळे  
(d) भारत काळे

- (vi) 'ओलें मूळ भेदी खडकाचें अंग ।  
आभ्यासासी सांग कार्यसिद्धि ॥'  
— हा अभाग कोणत्या संतकवीचा आहे ?
- (a) संत ज्ञानेश्वर  
(b) संत नामदेव  
(c) संत एकनाथ  
(d) संत तुकाराम
- (vii) भगवद्गीतेवर ..... ही टीका वामन पंडितांनी लिहिली.
- (a) भावार्थदीपिका  
(b) यथार्थदीपिका  
(c) गीतारहस्य  
(d) गीतरामायण
- (viii) ही सांग सखे सुंदरी  
कुण्या ग ..... मदनमंजरी.
- (a) राजाची  
(b) कुणव्याची  
(c) सुभगाचि  
(d) इंद्राची
- (ix) ..... हा जाहिरातीचा प्राणच असतो.
- (a) घोषवाक्य  
(b) मसुदा  
(c) मथळा  
(d) वरीलपैकी नाही

(x) मराठी साहित्य मंडळाने पुरस्कृत केलेल्या मराठी लेखनविषयक .....  
नियमांना महाराष्ट्र शासनाने 1962 साली मान्यता दिली.

- (a) चौदा
- (b) सोळा
- (c) आठ
- (d) वीस

### Theory

2. खालीलपैकी कोणताही एक प्रश्न सोडवा : 10
- (i) 'वेळेचा व्यर्थ खर्च' या लेखातील परखड विचार स्पष्ट करा.
  - (ii) भारत काळे यांनी ग्रामीण कुटुंबातील ताणतणावाचे चित्रण कसे केले आहे ते सांगा.
3. खालीलपैकी कोणताही एक प्रश्न सोडवा : 10
- (i) संत तुकारामांनी समाजाला कोणती शिकवण दिली आहे ते पाठ्यपुस्तकातील अभंगाधारे सांगा.
  - (ii) मराठी भाषेची थोरवी ना.गो. नांदापूरकर यांनी आपल्या कवितेतून कशाप्रकारे व्यक्त केली आहे.
4. खालीलपैकी कोणताही एक प्रश्न सोडवा : 10
- (i) जाहिरातीची संकल्पना स्पष्ट करून जाहिरातीचे प्रकार सांगा.
  - (ii) मराठी प्रमाणलेखनाचे अनुस्वारविषयक नियम लिहा.

This question paper contains 4+2 printed pages]

**P—427—2015**

**FACULTIES OF ARTS/COMMERCE/SCIENCE**

**B.A./B.Com./B.Sc. (Third Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2015**

**HINDI (Second Language)**

(कथेतर गद्य—III)

(MCQ + Theory)

**(Saturday, 19-12-2015)**

**Time : 10.00 a.m. to 12.00 noon**

*Time—Two Hours*

*Maximum Marks—40*

**N.B. :- (i) सभी प्रश्न अनिवार्य हैं ।**

(ii) बहुपर्यायी प्रश्नों (MCQs) के लिए नकारात्मक अंकदान है ।

(iii) थ्योरी (Theory) प्रश्नों के आगे अंक दिए गए हैं ।

**MCQ**

1. निम्नलिखित बहुपर्यायी प्रश्नों (MCQs) के सही उत्तर दीजिए : 10

(i) 'मजदूरी और प्रेम' निबंध के रचनाकार कौन हैं ?

(a) सेठ गोविंददास

(b) सरदार पूर्णसिंह

(c) राजेन्द्र यादव

(d) महादेवी वर्मा

P.T.O.

(ii) "पेशवा, इस समय तो मैं केवल एक घोषणा करता हूँ—भविष्य में अगर कोई ऐसा कार्य करेगा तो उसका सिर उस समय धड़ से जुदा कर दिया जाएगा ।" यह संवाद कौनसी रचना से लिया है ।

- (a) शिवाजी का सच्चा स्वरूप
- (b) मेरी मौत के बाद
- (c) पत्र
- (d) चीनी फेरीवाला

(iii) लतीफ घोंघी की पहली रचना कौनसी पत्रिका में प्रकाशित हुई ?

- (a) हिंदू
- (b) सरस्वती
- (c) नौक-झोंक
- (d) हंस

(iv) 'मेरा हमदम, मेरा दोस्त कमलेश्वर'—यह साहित्य की .....  
विधा है ।

- (a) रिपोर्ताज
- (b) आत्मकथा
- (c) संस्मरण
- (d) रेखाचित्र

- (v) महादेवी वर्मा की प्रारंभिक शिक्षा कहाँ पर सम्पन्न हुई ?
- (a) लखनऊ
- (b) फर्रुखाबाद
- (c) इन्दौर
- (d) प्रयाग
- (vi) ..... की हत्या के जुर्म में भगतसिंह को फाँसी की सजा दी ।
- (a) सैंडर्स
- (b) डायर
- (c) कर्जन
- (d) लॉर्ड बेकन
- (vii) डॉ. बाबासाहेब अम्बेडकरजी ने कौनसे विश्वविद्यालय से पी.-एच.डी. की उपाधि प्राप्त की ?
- (a) केंब्रिज
- (b) कोलंबिया
- (c) उस्मानिया
- (d) लखनऊ विश्वविद्यालय

(viii) 'कस्तूरी कुंडल बसै' यह ..... की रचना है ।

(a) मैत्रेयी पुष्पा

(b) महादेवी वर्मा

(c) मणि मधुकर

(d) अमृत राय

(ix) मणि मधुकर कौनसे प्रदेश के सुप्रसिद्ध साहित्यकार हैं ?

(a) उत्तर प्रदेश

(b) राजस्थान

(c) मध्य प्रदेश

(d) महाराष्ट्र

(x) प्रेमचंद की लड़की का कन्यादान किसने किया ?

(a) प्रेमचन्द

(b) लड़की के मामा

(c) लड़की की माँ

(d) लड़की का भाई

**Theory**

2. संदर्भ सहित व्याख्या कीजिए :

5

“अरे हमने भगवान की गाय नहीं मारी, हमारे लिए भी उसके दरबार में न्याय है । तेरे बाप के जाने के बाद क्या हमारी मुसीबतें ईश्वर देखता न होगा ।”

**अथवा**

“आज जहाँ अनपढ़ लड़की पर उँगलियाँ उठती हैं, चालीस-पैंतालीस साल पहले पढ़ी-लिखी लड़की पर उठा करती थीं । लड़की को पढ़ाना अपने आप में एक क्रांति थी ।”

3. “‘चीनी फेरीवाला’ रेखाचित्र में चीनी व्यक्ति के जीवन में आयी विभिन्न आपदाओं को व्यक्त किया गया है ।” स्पष्ट कीजिए ।

10

**अथवा**

‘मेरी मौत के बाद’ व्यंग्य में लतीफजी ने मनुष्य की स्वार्थी प्रवृत्ति पर प्रकाश डाला है, विवेचन कीजिए ।

4. “शिवाजी का सच्चा स्वरूप” एकांकी में शिवाजी राजा का नारी के प्रति उदात्त भाव प्रकट हुआ है, स्पष्ट कीजिए ।

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P.T.O.

अथवा

'मेरा हमदम, मेरा दोस्त कमलेश्वर' इस रेखाचित्र के आधार पर कमलेश्वर की चारित्रिक विशेषताओं पर प्रकाश डालिए ।

5. टिप्पणी लिखिए :

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'पत्र' में व्यक्त सरदार भगतसिंह की देशभक्ति .....

अथवा

'सूखे चेहरों का भूगोल' पाठ के दुले खाँ .....