

B.Sc. (Non- Medical) 2nd Semester examination, May-2016
Subject- Number Theory and Trigonometry (Paper code - 09010201)

Time: 3 Hours

Maximum Marks-40

Instruction:

1. Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
2. Attempt five questions in all. Question No. 1 is compulsory. Attempt remaining four questions out of unit II TO III, selecting at least one question from each unit.
3. All question carry marks as noted against each question.

Q1. Answer all the following questions.

- (a) Find the remainder when 2^{340} is divided by 341. (2)
- (b) Define Legendre symbol. (2)
- (c) State Gregory's Series. (2)
- (d) Write the formula to find the sum of sines of n angles when the angles are in arithmetical progression (A.P). (2)

UNIT- 1

- Q2. (a) If n is an integer, show that $n(n^2 - 1)(3n + 2)$ is divisible by 24. (4)
- (b) Find the g.c.d. of 858 and 325 and express it in the form $m \cdot 858 + n \cdot 325$. (4)

OR

- Q3. (a) Solve the congruence $15x = 12 \pmod{36}$. (4)
- (b) Show that the fourth power of every number is of the form $5k$ or $5k + 1$, where k is any positive integer. (4)

UNIT - 2

- Q4. (a) If p and $2p + 1$ are both prime and $n = 4p$, then show that $\phi(n + 2) = \phi(n) + 2$. (4)
- (b) If $p > 3$, prove that the sum of the quadratic residues is divisible by p . (4)

OR

- Q5. (a) Show that the smallest positive quadratic non- residue of an odd prime p is itself prime. (4)
- (b) List all the quadratic residues of the prime 7. (4)

UNIT - 3

- Q6. (a) If $x_r = \cos \frac{\pi}{2r} + i \sin \frac{\pi}{2r}$, prove that $x_1 \cdot x_2 \cdot x_3 \dots \dots \dots \infty = -1$. (4)
- (b) Separate $10 \operatorname{gsin}(x + iy)$ into real and imaginary parts. (4)

OR

- Q7. (a) Find the sum of the series:
 $\sec a \sec 2a + \sec 2a \sec 3a + \sec 3a \sec 4a + \dots$ to n terms. (4)
- (b) If $x > 0$, prove that $\tan^{-1} x = \frac{\pi}{4} + \left(\frac{\pi-1}{x+1}\right) - \frac{1}{3} \left(\frac{x-1}{x+1}\right)^3 + \frac{1}{5} \left(\frac{x-1}{x+1}\right)^5 - \dots$. (4)

B.Sc. (Non- Medical) 2nd Semester examination, May-2016
Subject-Ordinary Differential Equation (Paper code - 09010202)

Time: 3 Hours

Maximum Marks-40

Instruction:

- Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
- Attempt five questions in all. Question No. 1 is compulsory. Attempt remaining four questions out of unit II to III, selecting at least one question from each unit.
- All question carry marks as noted each question.

Q1. Answer all the following questions. (2 x 4 = 8)

- What do you mean by an integrating factor?
- Solve $\frac{dy}{dx} = e^{x+y} + x^2 e^{x^3+y}$.
- Outline the steps to find the equations of orthogonal trajectories.
- What are total differential equations?

UNIT - 1

- Q2.** (a) Verify that the differential equation $(1 + e^{xy}) dx + e^{xy} (1 - \frac{x}{y}) dy = 0$ is exact and solve it. (4)
- (b) Solve $p^2 + 2py \cot x = y^2$. (4)

OR

- Q3.** (a) Reduce $xyp^2 - (x^2 + y^2 + 1)p + xy = 0$ to Clairaut's form and find its singular solution. (4)
- (b) Find the complete primitive and singular solution of the differential equation (4)
- $$\sin\left(x \frac{dy}{dx}\right) \cos y = \cos\left(x \frac{dy}{dx}\right) \sin y + \frac{dy}{dx}$$

UNIT-II

- Q4.** (a) Find the orthogonal trajectory of $r = f(\theta) = a(1 - \sin\theta)$. (4)
- (b) Show that $\frac{1}{D-\alpha} x = e^{ax} f(e^{-\alpha x} x) dx$, no arbitrary constant being added. (4)

OR

- Q5.** (a) Solve the differential equation (4)
- $$x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \log x.$$
- (b) Apply method of variation of parameters to solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$. (4)

UNIT -3

- Q6.** Solve $\frac{dx}{dt} + y = \sin t$, $\frac{dy}{dt} + x = \cos t$, given that $x = 2, y = 0$ when $t = 0$. (8)

OR

- Q7.** (a) Solve $\frac{xdx}{x^2 - 2yz - y^2} = \frac{dy}{y+z} = \frac{dz}{y-z}$ (4)
- (b) Solve $yz^2 dx - xz^2 dy - (2xyz + x^2) dz = 0$, (4)

B.Sc. (Non- Medical) 2nd Semester examination, May-2016
[Subject - Mathematics (Solid Geometry); Paper code – 09010203]

Time: 3 Hours

Maximum Marks-40

Instruction:

- Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
- Attempt five questions in all. Question No. 7 is compulsory. Attempt remaining four questions out of Unit-I to Unit-III, selecting at least one question from each unit.
- All question carry marks as noted against each question.

Q1. Answer all the following question.

- (a) Define and write the equation of confocal conics. (4)
- (b) Write the equation of central conicoid. (4)
- (c) Write the equation of Director Sphere. (4)
- (d) If two spheres cuts each other at right angle, write the radius of common circle. (4)

UNIT – 1

- Q2.** (i) Prove that two confocal cuts at right angles. (4)
- (ii) Show that in a conic the semi latus-rectum is the harmonic mean between the segments of a focal chord.. (4)

OR

- Q3.** (i) What conic is represented by the equation (4)
- $$2x^2 - 72xy + 23y^2 - 4x - 28y - 48 = 0.$$
- Also find its centre and the equation referred to the conic.
- (ii) Find the polar equation of directrix of a conic, the focus being its pole. (4)

UNIT – 2

- Q4.** (i) Find the equation of a sphere which passes through the circle (4)
- $$x^2 + y^2 + z^2 - 2x + 3y - 4z + 6 = 0, 3x - 4y + 5z - 15 = 0$$
- and cuts orthogonally the sphere
- $$x^2 + y^2 + z^2 + 2x + 4y - 6z + 11 = 0$$
- (ii) Find the equation of the right circular cone whose vertex is at the origin axis is (4)
- $$\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$$
- and vertical angle is 60°

OR

- Q5.** (i) Find the equation of the right circular cylinder whose guiding curve is (4)
- $$x^2 + y^2 + z^2 = 9, x - y + z = 3.$$
- (ii) Find the equation of the right circular cylinder of radius 2 whose axis passes through (1,2,3) and has direction ratios (2,-3,6). (4)

UNIT - 3

Q6. (i) If a right circular cone has three mutually perpendicular generators, show that the semi vertical angles is $\tan^{-1} \sqrt{2}$. (4)

(ii) Prove that the equation of the cone with vertex at origin and which passes through the curve $ax^2 + by^2 + cz^2 = 1, lx + my + nz = p$ is $p^2 (ax^2 + by^2 + cz^2) = (lx + my + nz)^2$. (4)

OR

Q7. Prove that the tangent planes to the conicoid are $lx + my + nz = \pm \sqrt{\left(\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c}\right)}$ (8)

4028/01

B.S.C. (NON- MEDICAL) 2ND SEMESTER EXAMINATION, MAY-2016**(PROPERTIES OF MATTERS & KINETIC THEORY OF GASES; PAPER CODE-09010204)****Time: 3 Hours****Maximum Marks-40****Instruction:**

1. Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
2. Attempt five questions in all. Question No. 1 is compulsory. Attempt remaining four questions out of Unit-I to III, selecting at least one question from each unit. Marks are indicated against each.
3. Draw Diagram if required.

Q1. Answer all the following question.

(2x4=8)

- (a) Define longitudinal strain and what is its value if the length of wire is doubled?
- (b) Define Poisson's ratio and what its theoretical limitation are.
- (c) Define most probable velocity and how it is related with temperature?
- (d) What do you mean by Brownian motion?

UNIT-IQ2. (a) Show that Bulk modulus K , Young's modulus Y and Poisson's ratio σ are connected by relation $K = Y/3(1-2\sigma)$.

(5)

(b) What couple must be applied to a wire 1m long and 3mm in diameter to twist one of the ends through 30° , when other end remains fixed? Given $\eta = 5 \times 10^{10} \text{Nm}^{-2}$.

(3)

Q3. (a) What is cantilever? Drive an expression for the depression of a cantilever at a distance from fixed end.

(5)

(b) A brass bar of 2 cm^2 in cross section and 200cm length is clamped in horizontal position at one end and a weight of 3kg is applied at other end. Calculate the depression produced. Given $Y = 9.8 \times 10^{10} \text{Nm}^{-2}$.

(3)

UNIT-IIQ4. (a) Explain the terms degree of freedom 'n', Using law of equilibration of energy, show that for a perfect gas $C_p / C_v = (1 + 2/n)$ symbols have their usual meaning.

(5)

(b) Calculate mean free path at N.T.P. of a gas molecule having diameter $3 \times 10^{-8} \text{ cm}$.

(3)

Q5. (a) State law of equipartition of energy and determine the number of degree of freedom for Monatomic, diatomic and diatomic gases.

(5)

(b) At what temperature, pressure remains constant, will r.m.s. velocity of a gas be half of its value at 0° C .

(3)

UNIT-III

Q6. (a) Drive the expression for Maxwell's law of distribution of velocity and explain it by its distribution Curve.

(5)

(b) Calculate r.m.s. speed of oxygen molecules at 27° C .

(3)

Q7. (a) State transport of energy and establish the relation between thermal conductivity of a gas K , Coefficient of viscosity and specific heat of that gas under constant volume.

(5)

(b) The viscosity of oxygen at temp 27° C is $200 \mu\text{p}$. Calculate the diameter of molecules of gas.Given Av. No. 6.02×10^{23} and mol. Wt. 32 and $K = 1.38 \times 10^{-16} \text{ ergs per Kelvin}$.

(3)

Sr. No: 4030

Roll. No: _____

B.Sc. (Non- Medical) 2nd Semester examination, May-2016
Subject- Electromagnetic Theory and Fiber Optics (Paper code - 09010205)

Time: 3 Hours

Maximum Marks-40

Instruction:

1. Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
2. Attempt five questions in all. Question No. 1 is compulsory. Attempt remaining four questions out of unit I TO III, selecting at least one question from each unit.
3. All question carry marks as noted against each question.

- Q1.** Explain the following terms. (4x2=8)
- (a) Faraday's law of induced EMF and its physical significance
 - (b) Displacement current
 - (c) Poynting vector
 - (d) Fractional refractive index

UNIT – I

- Q2.** Derive the Max well equations in electromagnet theory and explain their physical significance. Write Maxwell equations for free space. (8)
- Q3.** Discuss the propagation of electromagnetic wave in free space. If the magnitude of H in plane EM wave is 1 amp/m, calculate the magnitude of E for plane wave in free space. Assume the values of the constant used. (8)

UNIT – II

- Q4.** Write Maxwell's equation for dielectric medium. Describe the propagation of electromagnetic wave in dielectric medium. (8)
- Q5.** State and derive poynting theorem. Calculate the magnitude of poynting vector at the surface of the sun. Given that power radiated by the Sun = 3.8×10^{26} watts and radius of the sun = 7×10^8 m. (8)

UNIT – III

- Q6.** Derive the relation for the acceptance angle and numerical aperture of the optical fiber. Calculate the N.A. and acceptance angle of optical; fiber with $\mu_{\text{core}} = 1.62$ and $\mu_{\text{clad}} = 1.52$. (8)
- Q7.** Explain different modes of optical fiber. Discuss on different applications of the optical fibers? (8)

B.SC. (NON MEDICAL) – II SEMESTER EXAMINATION, MAY 2016**(Sub: INORGANIC CHEMISTRY-II) Paper Code: 09010207****Time: 03 Hours****Max. Marks: 40****Instructions:**

1. Write Roll No. on the Question Paper.
2. Candidate should ensure that they have been provided the correct question paper. Complaint(s) in this regards, if any, should be made within 15 minutes of the commencement of the examinations. No complaint(s) will be entertained thereafter.
3. Attempt five (05) questions in all. Question No.1 is compulsory. Attempt remaining four questions out of sections - I to III, Selecting one question from each unit .
4. All question carry equal marks.

Q1. Answer all the following question. (2X4=8)

- (a) Xenon forms compounds with fluorine and oxygen only?
- (b) What is inorganic benzene?
- (c) Explain why H_3PO_2 is monobasic?
- (d) Give the two uses of H_2O_2 ?

Section – I

- Q2. (a) Explain the difference between intermolecular and intermolecular hydrogen bond with suitable example? (3)
- (b) What is the meant by n – type and p – type semiconductors? What is the effect of temperature on semiconductors? (3)
- (c) Why Be and Mg gives no colour in flame? (2)

Q3. How do XeO_3 and XeO_3F_2 differ in their structure? (3)

- (a) What is diagonal relationship? Explain by taking an example of Be and Al? (3)
- (b) Give the reactions of complete hydrolysis and reaction with SiO_2 of XeF_6 ? (2)

Section – II

- Q4. (a) What are silicates? Write structure of different types of silicates? (6)
- (b) Why BF_3 exist but BH_3 does not exist? (2)

Q5. (a) What is catenation? How catenation tendency vary in group 14? (3)

- (b) Discuss the action of diborane with ammonia and alkalis? (3)
- (c) Give the difference between Mg_2C_3 and CaC_2 ? (2)

Section – III

Q6. (a) Describe the structure of white and red phosphorus? (3)

(b) Explain the following (3)

I. NO is paramagnetic.

II. H_2SO_4 acid is highly viscous.

(c) Which is stronger H_3PO_3 or H_3PO_4 and why? (2)

Q7. (a) What are interhalogen compounds? Discuss their general characteristics? (3)

(b) Discuss the structure of sulphurous acid? (3)

(c) Give the evidence for the existence of cationic iodine? (2)

B.SC. (NON- MEDICAL) 2ND SEMESTER EXAMINATION, MAY-2016
Subject- PHYSICAL CHEMISTRY – II (Paper code - 09010208)

Time: 3 Hours

Maximum Marks-40

Instruction:

1. Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
2. Attempt five questions in all. Question No. 1 is compulsory. Attempt remaining four questions out of unit I TO III, selecting at least one question from each unit.
3. All question carry marks as noted against each question.

- Q1.** Answer all the following questions. (2x4 = 8)
- (a) State and explain rate law.
 - (b) Define half life period of a reaction.
 - (c) What do you understand by the term specific conductance. How it varies with dilution.
 - (d) Define Buffer solution with examples.

UNIT - I

- Q2.** (a) Show that the half life period for a first order reaction is independent on the concentration of the reactants? (5)
- (b) The half life period for a reaction (1st order) is 6.93 seconds. Calculate to rate constant? (3)
- Q3.** (a) How Arrhenius accounted the effect of temperature on the rate of reaction. (4)
- (b) State and explain the transition state theory. How it is important over the collision theory. (4)

UNIT - II

- Q4.** (a) Discuss Debye – Hackle – Onsager equation? Mention its validity. (4)
- (b) Define Ostwald's dilution law. Mention its validity and limitations? (4)
- Q5.** (a) What are the transport Numbers. What are the factors effecting these numbers. (4)
- (b) Define molar conductance. How it is related with specific conductance? (4)

UNIT – III

- Q6.** Write note on the following:
- (a) Solubility and solubility products (4)
 - (b) Buffer solution and buffer actions (4)
- Q7.** (a) State and explain kohlarusch's law. Mention its important applications. (4)
- (b) Write a short note on the conductmetric titration. (4)

Sr. No: 4033

Roll. No: _____

B.SC. (NON- MEDICAL) 2ND SEMESTER EXAMINATION, MAY-2016
Subject- ORGANIC CHEMISTRY - II (Paper code - 09010209)

Time: 3 Hours

Maximum Marks-40

Instruction:

1. Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.
2. Attempt five questions in all. Question No. 1 is compulsory. Attempt remaining four questions out of unit I TO III, selecting at least one question from each unit.
3. All question carry marks as noted against each question.

- Q1.** Answer all the following questions. (2x4=8)
- (a) What is Markownikoff's rule?
 - (b) Write is Electrophilic addition Reaction in alkenes?
 - (c) Write the IUPAC name of $\text{CH}_3\text{-CHCl-CH}_3$.
 - (d) What is conjugated diene, given one example.

UNIT - I

- Q2.** (a) Dehydration of 1- Butanol by conc. H_2SO_4 yields 2- Butene instead of 1- Butene. Explain. (4)
(b) What happens when? (2x2=4)
(i) Ethene is treated with dil. Aq. Solution of KMnO_4 .
(ii) Propene undergoes Ozonolysis.
- Q3.** (a) Discuss the mechanism of Peroxide effect. (4)
(b) Compare the values of Dipole moment in Cis & Tran's 2-Butene. Explain. (4)

UNIT - II

- Q4.** (a) Explain Huckel rule by taking suitable examples. (4)
(b) In Organic synthesis, Friedal Craft's acylation is preferred over Friedal Craft's Alkylolation. Comment. (4)
- Q5.** (a) Explain the Mechanism of Nitration of Benzene. (4)
(b) Explain the Ortho- Para directing effect of methyl group in Toluene during electrophilic Substitution. (4)

UNIT - III

- Q6.** (a) Compare the reactivity of Vinyl halide Vs Alkyl halide. (4)
(b) Write the evidences in support of benzyne mechanism for nucleophilic aromatic substitution. (4)
- Q7.** (a) Write the mechanism of addition of Bromine to 1,3- Butadiene. (4)
(b) Write a note on Diel's alder reaction. (4)
