Sr. No: 9416(S)   Roll No_____

B. SC. (NON MEDICAL) – 2ND SEMESTER EXAMINATIONS; OCTOBER - 2017

[SUB: - NUMBER THEORY AND TRIGNOMETRY; PAPER CODE: 09010201]

Time: 3 Hrs.   **Max. Marks: 40**

Instructions:-
1. Write your Roll No. on the Question paper.
2. Candidates should ensure that they have been provided correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter.
3. Attempt 5 Questions in all, Question No. 1 is compulsory. Attempt other 4 questions selecting at least one question from each unit.
4. All question carry equal marks.

Q1. Answer the following questions.   (2X4=8)

    (a) Define divisibility.

    (b) Prove that $\sin h(x + y) \cos h(x - y) = \frac{1}{2} (\sin h2x + \cos h2x)$

    (c) Define congruence with example.

    (d) Find the general value of $\log(4 + 3i)$

UNIT-I

Q2. (a) If $ca \equiv cb(mod\ m)$ and $(c, m) = d$ and $m = dn$, then $\equiv b(mod\ n)$. also prove the converse.   (4)

    (b) Solve the congruence $15x \equiv 12(mod\ 21)$.   (4)

Q3. (a) State and prove Wilson's theorem.   (4)

    (b) If P is an odd prime, then show that

$$2^2 . 4^2 . 6^2 \dots (p - 1)^2 \equiv (-1)^{\frac{p+1}{2}} (mod\ p)$$ (4)

UNIT-II

Q4. State and prove Chinese remainder theorem   (8)

Q5. (a) Find the order of 43(mod 18)   (4)

    (b) Evaluate $\emptyset(600)$.   (4)

UNIT-III

Q6. (a) Prove that the nth root of unity form a series in G.P and show that their product is equal to $(-1)^{n-1}$ (4)

    (b) Find the three cube roots of unity.   (4)

Q7. (a) Find the sum of the series: $3sin\alpha + 5sin2\alpha + 7sin3\alpha + \cdots to\ n$ terms.   (4)

    (b) Find the sum of the series: $sin\alpha + \frac{1}{2}sin2\alpha + \left(\frac{1}{2}\right)^2 sin3\alpha + \cdots \infty$ (4)

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Sr. No: 9417(S)   Roll No_____

B. SC. (NON MEDICAL) – 2ND SEMESTER EXAMINATIONS; OCTOBER- 2017

[SUB: - ORDINARY DIFFERENTIAL EQUATION; PAPER CODE: 09010202]

Time: 3 Hrs.   **Max. Marks: 40**

Instructions:-
1. Write your Roll No. on the Question paper.
2. Candidates should ensure that they have been provided correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter.
3. Attempt 5 Questions in all, Question No. 1 is compulsory. Attempt other 4 questions selecting at least one question from each unit.
4. All question carry equal marks.

Q1. (a) Solve the differential equation: $(D^4 + 5D^2 + 6)y = 0$ (2X4=8)

(b) Differentiate between orthogonal trajectory and oblique trajectory.

(c) Find the integrating factor for the equation: $(1 + xy)y\, dy + (1 - xy)\, xdy = 0$

(d) Solve $\quad px - y + \sqrt{a^2p^2 + 4} = 0$.

UNIT-I

Q2. (a) Find the necessary and sufficient conditions that the equation $Mdx + Ndy = 0$ may be exact.   (4)

(b) Solve $(2x^2y - 3y^2)dx + (3x^3 + 2xy^3)dy = 0$ (4)

Q3. (a) Solve the differential equation: $y = 2px + y^2p^3$ (4)

(b) Solve and find the complete primitive and singular solution of the equation:

$3y = 2px - 2p^2/x$ (4)

UNIT-II

Q4. (a) Find the orthogonal trajectories of the cardioid $r = a(1 - \cos\theta)$ where a is the parameter.   (4)

(b) Solve the differential equation. $\frac{d^3y}{dx^3} - 3\frac{dy}{dx} + 2y = x^2e^x$.   (4)

Q5. (a) Solving the differential equation $x^2\frac{d^2y}{dx^2} + 8x\frac{dy}{dx} + 13y = \log x$ (4)

(b) Solve $\cos x\frac{d^2y}{dx^2} + \sin x\frac{dy}{dx} - 2y\cos^3x = 2\cos^5x$ (4)

UNIT-III

Q6. (a) Solve the following simultaneous equations:

$\frac{dx}{dt} - 7x + y = 0$ and $\frac{dy}{dt} - 2x - 5y = 0$ (4)

(b) Solve the simultaneous equations:-

$\frac{xdx}{z^2-2yz-y^2} = \frac{dy}{y+z} = \frac{dz}{y-z}$ (4)

Q7. (a) Solve the total differential equation $yz(y + z)dx + zx(x + z)dy + xy(x + y)dz = 0$. (4)

(b) Solve $(x - 3y - z)dx + (2y - 3x)dy + (z - x)dz = 0$ (4)

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B. SC. (NON MEDICAL) – 2ND SEMESTER EXAMINATION; OCTOBER - 2017

[SUB: - PROPERTIES OF MATTERS AND KINETIC THEORY OF GASES]
[PAPER CODE: 09010204]

Time: 3 Hrs.   **Max. Marks: 40**

Instructions:-
1. Write your Roll No. on the Question paper.
2. Candidates should ensure that they have been provided correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter.
3. Attempt 5 Questions in all, Question No. 1 is compulsory. Attempt other 4 questions, selecting at least one question from each unit.
4. All question carry equal marks.

Q1. Answer the following: (2X4=8)

  a) Define all the three elastic constants for an isotropic solid.
  b) What is Poisson ratio?
  c) Describe the law of equipartition of energy.
  d) Explain why Moon has no atmosphere.

UNIT-I

Q2. (a) Derive the relation between Young's Modulus Y, the bulk modulus K and Poisson's ratio.   (4)

  (b) What couple must be applied to a wire 1m long and 3 mm in diameter to twist one of the ends through 30^0, when other end remains fixed? Given $\eta = 5 \times 10^{10}$ Nm^{-2} (4)

Q3. (a) State and derive Bernoulli's theorem.   (5)

  (b) Discuss about airplane wing and spinning of cricket ball on the basis of Bernoulli's theorem.   (3)

UNIT-II

Q4. (a) Using law of equipartition of energy, for "n" degree of freedom, shows that for a perfect gas $C_p/C_v = (1+2/n)$, where symbols have their usual meaning.   (4)

  (b) At what temperature, pressure remains constant, when r.m.s velocity of a gas will be half of its value at 0°C.   (4)

Q5. (a) State Vander Waal's equation.   (2)

  (b) Determine the pressure in atm exerted by 1 mole of methane placed into a bulb with a volume of 244.6 mL at 25^{0}C. Carry out two calculations: in the first calculation, assume that methane behaves as an ideal gas; in the second calculation, assume that methane behaves as a real gas and obeys the van der Waals equation.   (6)

  (Given R = 0.08205L atm mol^{-1} K^{-1}, a = 2.303 L^2 atm mol^{-2} and b= 0.0431L/mol)

UNIT-III

Q6. (a) A vessel contains 5g of helium, molar mass 4g, at 27^0 C and 1.5×10^5 Pa pressure.

Calculate: (4)

    a) The root-mean-square speed of the molecules.

    b) The number of molecules per unit volume present.

    (Assume R= $8.3 JK^{-1} mol^{-1}$, $N_A = 6.0 \times 10^{23} mol^{-1}$)

  (b) Derive the expression for Maxwell's Law of distribution of velocity and explain

    distribution Curve. (4)

Q7. (a) Derive an expression for the root-mean-square speed of the molecules of a gas. (4)

  (b) The number of molecules per m^3 in a given gas is 1.2×10^{24} m^{-3} at 27^0 C and 1.0×10^5
Pa pressure. Calculate the number of molecules per unit volume of this gas at a temperature
of -23 ^{0}C and a pressure of 2×10^3 Pa. (4)

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B. SC. (NON MEDICAL) – 2ND SEMESTER EXAMINATION; OCTOBER - 2017

[SUB: - ORGANIC CHEMISTRY-II; PAPER CODE: 9010209]

Time: 3 Hrs.　　　　　　　　　　　　　　　　　　　**Max. Marks: 40**

Instructions:-
1. Write your Roll No. on the Question paper.
2. Candidates should ensure that they have been provided correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter.
3. Attempt 5 Questions in all, Question No. 1 is compulsory. Attempt other 4 questions selecting at least one question from each unit.
4. All question carry equal marks.

Q1. Answer all the questions:　　　　　　　　　　　　　　　　　　　**(2X4=8)**

　　a) Cis- alkenes have slightly higher boiling point than trans- alkenes. Explain.
　　b) Explain Saytzeff rule giving example.
　　c) C-X bonds of aryl halides are shorter and stronger than those of alkyl halides. Explain.
　　d) Write a note on stability of conjugated dienes.

UNIT-I

Q2. (a) Write mechanism of mixed addition of alkene (i.e. bromination in presence of Cl$^-$ or H_2O).　　**(4)**
　　(b) Explain catalytic hydrogenation of $CH_2 = CH_2$, ethylene by energy diagram.　　**(4)**

Q3. (a) Write mechanism of oxymercuration – demercuration of alkenes.　　**(4)**
　　(b) During the addition of HX to unsymmetrical alkene, the H^+ of HX goes to the double bonded carbon that already has the greatest number of hydrogen but in the presence of organic peroxide (R-O-O-R) opposite to this occurs. Explain.　　**(4)**

UNIT-II

Q4. (a) Both cyclopentadienyl anion (five membered) and tropylium cation (seven membered) are aromatic compounds. Explain.　　**(4)**
　　(b) Write a note on Friedal Craft alkylation.　　**(4)**

Q5. (a) What are activating and deactivating group? Pick out of the groups which are activating and deactivating, -Br, -NH_2, --C (=O)-OH, -CH_3, -NO_2 ,- CN.　　**(4)**
　　(b) Explain directive effect(s) of -NH_2 group.　　**(4)**

UNIT-III

Q6. (a) How will you distinguish between 1-butyne and 2- butyne? Explain with the help of chemical reactions.　　**(4)**
　　(b) What is the difference between isolated, cumulated and conjugated dienes? Explain with suitable examples.　　**(4)**

Q7. (a) Explain mechanism of Diels Alder Reaction taking the example of diene and a good Dienophile.　　**(4)**
　　(b) Write a note on the addition- elimination and the elimination – addition mechanisms Of nucleophilic aromatic substitution reactions.　　**(4)**

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