**Course Code: B20CSOS02**

**O P JINDAL UNIVERSITY**

**Mid-Semester Examination, April-2023**

**B.Sc. 4th Semester**

**ELEMENTS OF MODERN PHYSICS**

**SOS-B-PH403**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | K L |
|---|---|---|---|---|---|
| **Section A ( 10 marks)**<br>All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | If the de-Broglie wavelength of an electron is 7.3Å. Then the velocity of the electron is. Given, $m_e = 9.1 \times 10^{-31}$ kg and $h = 6.6 \times 10^{-34}$ Js. | 02 | CO-1 | K2 |
| | b. | X-rays wavelength is 80cm and is scattered $120^0$ by a target. Find out the scattered wavelength. | 02 | CO-1 | K2 |
| | c. | The half-life time $^{209}$Po is 102 years. How many alpha particles are emitted in 1 sec from 2mg sample of Po. | 02 | CO-6 | K2 |
| | d. | Define the Nuclear fission Process. | 02 | CO-6 | K1 |
| | e. | Define Stefan-Boltzmann's law. | 02 | CO-2 | K1 |
| **Section B (16 marks)**<br>Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | Define De – Broglie Hypothesis and what is matter wave. | 04 | CO-1 | K2 |
| | b. | Explain Half lifetime of the Radioactive element and derive an expression for it? | 04 | CO-6 | K2 |
| | c. | State and Prove the law of radioactivity. | 04 | CO-6 | K1 |
| | d. | Define Nuclear Fusion Process. Also, explain its necessary condition for its sustainability? | 04 | CO-6 | K1 |
| | e. | Define and draw the spectrum of a Black Body and also explain Stefan's law and Raleigh-Jean, Wein's law in the black body spectrum. | 04 | CO-1 | K1 |
| **Section C ( 24 marks)**<br>Answer any 3 questions [03 x 08 marks=24 marks] | | | | | |
| 3 | a. | What is Compton's Effect and derive an expression for Compton's shift? | 08 | CO-1 | K1 |
| | b. | Describe Davison Germer's Experiment to establish the wave nature of particles. | 08 | CO-1 | K1 |
| | c. | Define Group and Phase Velocity. Also, explain the Relation between them in the relativistic medium. | 08 | CO-1 | K1 |
| | d. | What is Steller energy? State type of nuclear reaction in sun and stars. Discuss Proton–Proton cycle and carbon-Nitrogen cycle. | 08 | CO-6 | K1 |
| | e. | What is the photoelectric effect? Define threshold frequency and work function. Give an account of Einstein explanation of photoelectric effect on the basis of quantum theory. | 08 | CO-6 | K2 |

**Course Code: (SOS-B-PH402)**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester Physics Honors**

**Department of Physics**

**CC IX: MATHEMATICAL PHYSICS – III [03UG023]**

**Time: 2 Hrs.** **Max. Marks: 50**

## Section A ( 20 marks)

Answer any 4 questions [04 x 05 marks=20 marks]

| | | | M | CO | KL |
|---|---|---|---|---|---|
| 1 | a. | Define Cauchy Riemann equation both in Cartesian and polar form. Check whether $f(z)=z^6$ is analytic or not? | 5 | 1 | 1 |
| | b. | Define harmonic function. Check whether $u=x^2-y^2$ is harmonic or not? | 5 | 1 | 1 |
| | c. | State and prove Cauchy Integral theorem. | 5 | 2 | 1 |
| | d. | Find the Laplace transform of $\sin^3 2t$ and $\sin 2t.\sin 3t$. | 5 | 4 | 2 |
| | e. | Evaluate $L\left\{\frac{e^{at}-\cos bt}{t}\right\}$ and $L\{t^2\cos at\}$. | 5 | 4 | 2 |

## Section B ( 30 marks)

Answer any 3 questions [03 x 10 marks=30 marks]

| | | | | | |
|---|---|---|---|---|---|
| 2 | a. | State and Prove Demoivre's theorem. If $x=\cos\theta+i\sin\theta$ then find the value of $x^n+\frac{1}{x^n}$. | 10 | 1 | 1 |
| | b. | Evaluate $\oint_C \frac{2z}{z^3(z^2+4)}dz$ where $C:\lvert z-2\rvert=4$. and $\oint_C \frac{1}{(z^2+4)}dz$, where $C:\lvert z-2\rvert=2$. | 10 | 2 | 2 |
| | c. | Define Unit Step Function. Express the following function in terms of unit step function: $f(t)=\begin{cases}t-1 & 1<t<2\\ 3-t & 2<t<3\end{cases}$ and find its *Laplace transform.* | 10 | 4 | 2 |
| | d. | Explain First Shifting Property and find the Laplace transform of $f(t)=\begin{cases}1 & 0\le t<1\\ t & 1\le t<2\\ t^2 & 2\le t<\infty.\end{cases}$ | 10 | 4 | 2 |

**Course Code: SOS-B-CH404**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc (Hons) Physics 4th Semester**

**GE-IV: Chemistry of s-block and p-block elements, states of matter & chemical kinetics**

**[Program code: 03UG021]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 20 marks)** Answer any 4 questions [04 x 05 marks=20 marks] | | | | | |
| 1 | a. | What is diagonal relationship? Give five similarities and five dissimilarities between lithium and aluminium. | 5 | 2 | 1 |
| | b. | Explain zero order reaction, giving examples. | 5 | 4 | 1 |
| | c. | Describe the general properties of p-block element (group 13) and explain under the following heads: (i) electronic configuration (ii) electronagativity | 5 | 2 | 1 |
| | d. | Explain the anomalous behavior of carbon in its group. | 5 | 2 | 1 |
| | e. | Why alkali metals are placed in s-block of the periodic table? Compare these metals under the following headings: (i) electronic configuration (ii) atomic radii (iii) ionization energy. | 5 | 2 | 1 |
| **Section B ( 30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Define electronegativity? Describe measurement scale of electronegativity. | 10 | 2 | 1 |
| | b. | Explain collision theory for the rate of reaction. | 10 | 4 | 2 |
| | c. | What is reaction velocity? Explain the factors influencing the rate of a reaction. | 10 | 4 | 1 |
| | d. | Explain the various method used for the determination of order of reaction. | 10 | 4 | 1 |

**Course Code: 03UG021**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B. Sc. 4th Semester**

**B. Sc.(Hon.), Physics**

**Linear Algebra and Numerical Methods[SOS-B-MA404]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

## Section A ( 20 marks)

Answer any 4 questions [05 x 04 marks=20 marks]

| | | | M | CO | KL |
|---|---|---|---|---|---|
| 1 | a. | Write a short note on Gauss Elimination Method and Solve $x + 4y - z = -5, x + y - 6z = -12, 3x - y - z = 4.$ | 05 | CO3 | K1 |
| | b. | Evaluate $\sqrt{12}$ to four places of decimal by using Newton-Raphson Method. | 05 | CO4 | K2 |
| | c. | Find a root of the equation $xe^x = \cos x$ by Secant method.(Four Steps Only) | 05 | CO4 | K1 |
| | d. | Prove that a Subset W of vector space V(F) is subspace of V if and only if $\forall\ \alpha, \beta \in W$ and $a, b \in F \Rightarrow a\alpha + b\beta \in W$ | 05 | CO1 | K1 |
| | e. | If $R^3(R)$ be a vector space then express the vector (1,-2,5) as a linear combination of the vector (1,1,1) ,(1,2,3) and (2,-1,1) | 05 | CO1 | K2 |

## Section B ( 30 marks)

Answer any 3 questions [03 x 10 marks=30 marks]

| | | | | | |
|---|---|---|---|---|---|
| 2 | a. | Find a root of an equation $f(x) = 3x + \sin x - e^x$, in the range using interval halving(Bisection method) and RegulaFalsi methods, compare the methods for three iterations only | 10 | CO4 | K1 |
| | b. | Define Gauss Jordan Method and Solve $x + y + z = 9, \quad 2x - 3y + 4z = 13, \quad 3x + 4y + 5z = 40$ | 10 | CO3 | K1 |
| | c. | Show that the Set of all ordered n-tuple form a vector space over field F. | 10 | CO1 | K1 |
| | d. | Check that the following sets of vectors are linearly dependent or linearly independent $\{(1,3,2), (1,-7,-8), (2,1,-1)\}$ and $\{(2,3,-1), (-1,4,-2), (1,18,-4)\}$ | 10 | CO1 | K2 |

**Program Code: 03UG021**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester Physics (Hons.)**

## School of Science

**Wave and Optics [SOS-B-PH401]**

**Time: 2 Hrs.** **Max. Marks: 50**

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Unit-I ( 20 marks)** Answer any 4 questions [04 x 05 marks=20 marks] | | | | | |
| 1 | a. | In Newton's ring experiment generally, the center is perfectly dark. Why? Can you obtain the bright center? If yes, how? | 5 | CO5 | KL3 |
| | b. | In Young's experiment, the distance of the screen from the two slits is 1.0 m. When the light of wavelength 6000Å is made incident, fringes of width 2.0 mm are obtained on the screen. Calculate (i) the distance between the slits, (ii) the fringe width if the wavelength of incident light is 4800Å. | 5 | CO1 | KL2 |
| | c. | Explain the formation of a spectrum from a plane transmission grating. | 5 | CO3 | KL1 |
| | d. | Find with respect to a point 50 cm distant, for wavelength 5.5 x $10^{-5}$ cm, how many half-period zones are contained in a circular hole of radius: (i) 1 mm, (ii) 1cm. | 5 | CO4 | KL2 |
| | e. | What are the Fresnel's assumptions to prepare half period zone? | 5 | CO4 | KL1 |
| **Unit-II ( 30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | What is Fresnel's biprism? Describe an experiment to determine the wavelength of sodium light with biprism. Deduce the formula used. | 10 | CO4 | KL2 |
| | b. | Explain the construction and working of Michelson's interferometer. How is interferometer adjusted to obtain the localized and circular fringes? | 10 | CO2 | KL3 |
| | c. | Explain Fresnel's half-period zone and deduce the resultant amplitude at the given point due to the whole wavefront. | 10 | CO4 | KL2 |
| | d. | Explain the construction and working of a zone plate and hence deduce an expression for its principal focal length. | 10 | CO4 | KL2 |

**Course Code: SOS-B-CH403**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester**

**Chemistry Hons.**

**`CHEMISTRY CC- X: PHYSICAL CHEMISTRY- IV [03UG022]**

**Time: 2 Hrs.** **Max. Marks: 50**

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 10 marks)** | | | | | |
| All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | Define the transport number of an ion. | 2 | 2 | 1 |
| | b. | Write five examples of each of strong and weak electrolyte | 2 | 1 | 1 |
| | c. | Define the ionic product of water. | 2 | 1 | 1 |
| | d. | Calculate the equivalent conductivity of 1M $H_2SO_4$ solution if its conductivity is $26 \times 10^{-2}$ $ohm^{-1}$ $cm^{-1}$ (Atomic weight of Sulphur = 32). | 2 | 1 | 2 |
| | e. | Define cell constant. How is it determined? | 2 | 1 | 1 |
| **Section B ( 16 marks)** | | | | | |
| Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | Explain molar and equivalent conductivity. | 4 | 1 | 1 |
| | b. | Derive the relation between transference number and ionic mobility. | 4 | 2 | 2 |
| | c. | Describe the moving boundary method for determination of transport number. | 4 | 2 | 2 |
| | d. | Explain the factors (only three) affecting the ionic conductance. | 4 | 1 | 2 |
| | e. | Illustrate how the solubility of a sparingly soluble salt can be determined with the help of conductance measurements. | 4 | 2 | 2 |
| **Section C ( 24 marks)** | | | | | |
| Answer any 3 questions [03 x 08 marks=24 marks] | | | | | |
| 3 | a. | Discuss the titration curve obtained in the conductometric titration of<br>i. An aqueous solution of HCl with an aqueous solution of NaOH.<br>ii. NaOH against $CH_3COOH$<br>iii. $CH_3COOH$ with $NH_4OH$ solution<br>iv. HCl solution with $NH_4OH$ solution | 8 | 2 | 2 |
| | b. | Explain the factors influencing the transport number of ions. | 8 | 2 | 3 |
| | c. | Explain the Kohlrausch's law and its two applications. | 8 | 2 | 2 |
| | d. | How do specific conductance, equivalent conductance and molar conductance vary with dilution? Discuss the variation of molar conductivity of strong and weak electrolyte with concentration. | 8 | 1 | 3 |
| | e. | The molar conductance at infinite dilution of potassium chloride, hydrochloric acid and potassium acetate are 130.1, 379.4 and 95.6 $ohm^{-1}$ $cm^2$ $mol^{-1}$ respectively. Calculate the value of molar conductance at infinite dilution for acetic acid. If a molar conductance of a given acetic acid solution is 48.5 $ohm^{-1}$ $cm^2$ $mol^{-1}$ at 298 K, calculate the degree of dissociation of acetic acid at this temperature. | 8 | 2 | 3 |

Course Code: SOS-B-CH402

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B. Sc. (H) 4th Semester**

**CHEMISTRY**

**ORGANIC CHEMISTRY- III [03UG022]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section-I (20 marks)** Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | Discuss the reduction of aromatic nitro compounds under different pH conditions. | 5 | 1 | 2 |
| | b. | Write the chemical reaction and predict the product obtained (any two):<br>i. Benzene diazonium chloride treated with phenol in alkaline medium<br>ii. 2-amino naphthalene treated with nitrating mixture<br>iii. Aniline treated with chloroform in strong alkali | 5 | 1 | 3 |
| | c. | Draw the canonical structures of Phenanthrene and compare reactivity and stability with Anthracene. | 5 | 2 | 3 |
| | d. | Write one method each for the synthesis of alkyl and aryl cyanides. | 5 | 1 | 2 |
| | e. | When Naphthalene is substituted by an electrophile, which is a preferred product, Explain. | 5 | 2 | 2 |
| **Section-II (30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Write short notes on the following (any two):<br>i. Gabriel's Phthalimide reaction<br>ii. Baltz – schiemann reaction<br>iii. Coupling reaction | 10 | 1 | 2 |
| | b. | Discuss one method for identification and separation of primary, secondary and tertiary amines | 10 | 1 | 2 |
| | c. | Elucidate the structure of Naphthalene | 10 | 4 | 3 |
| | d. | Discuss the synthesis of the following:<br>a. Phenanthrene by Pschorr Method<br>b. Naphthalene by Hawarth method | 10 | 2 | 3 |
| | e. | Discuss the mechanism of the following reactions (any two)<br>1. Hofmann-bromanide synthesis<br>2. Diazotization of aniline<br>3. Nef reaction | 10 | 1 | 2 |

Course Code: SOS-B-CH401

**O P JINDAL UNIVERSITY**

**Mid-Semester Examination, April-2023**

**B.Sc. 4th Semester**

**INORGANIC CHEMISTRY - III**

**[03 UG 023]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | K L |
|---|---|---|---|---|---|
| | | **Section A ( 10 marks)**<br>All Questions are compulsory [05 x 02 marks=10 marks] | | | |
| 1 | a. | Explain the Catalytic properties of d block elements. | 02 | CO 2 | K1 |
| | b. | Write electronic configuration of the elements : Cr, Zn, W | 02 | CO 2 | K1 |
| | c. | Write colors of some lanthanide elements. | 02 | CO 2 | K1 |
| | d. | To write any three similarities of Lanthanide and Actinide elements. | 02 | CO 3 | K1 |
| | e. | To write magnetic properties of lanthanide series elements | 02 | CO 2 | K1 |
| | | **Section B (16 marks)**<br>Answer any 4 questions [04 x 04 marks=16 marks] | | | |
| 2 | a. | What do you mean by oxidation state? To write inner transition series elements oxidation state. | 04 | CO 3 | K1 |
| | b. | Difference between the first, second and third transition series | 04 | CO 2 | K2 |
| | c. | To write difference between Actinide and Lanthanide elements. | 04 | CO 3 | K2 |
| | d. | To write electronic configuration of 3d series and 4f series elements | 04 | CO 3 | K1 |
| | e. | Explain Stability of oxidation states with Latimer & Bsworth diagrams. | 04 | CO 2 | K1 |
| | | **Section C ( 24 marks)**<br>Answer any 3 questions [03 x 08 marks=24 marks] | | | |
| 3 | a. | How we separate lanthanides? Explain ion-exchange method. | 08 | CO 2 | K2 |
| | b. | To write notes on Actinoid elements and their uses. | 08 | CO 3 | K1 |
| | c. | What do you understand by Lanthanide contraction ? | 08 | CO 2 | K1 |
| | d. | To write notes on Chemistry of Ti, Cr and Fe | 08 | CO 2 | K1 |
| | e. | To write notes on Transition elements with their comparative oxidation state, color, catalytic, magnetic properties and uses. | 08 | CO 2 | K1 |

**Course Code: SOS-B-MA401**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester**

**MATHEMATICS**

**NUMERICAL METHODS AND SCINTIFIC COMPUTING [03UG023]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note: Scientific Calculator is allowed

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 20 marks)** Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | i. Explain intermediate value property<br>ii. Find the number of iteration required for finding a root by Bisection method in the interval [0, 1]<br>iii. Explain different types of errors and sources of errors.(Briefly)<br>iv. Evaluate the sum $S=\sqrt{3}+\sqrt{5}+\sqrt{7}$ to 4 significant digits and find its absolute and relative errors.<br>v. Round off 37.46235 to four significant figures and compute absolute, relative and percentage error. | 5 | 3 | 1 |
| | b. | Find the negative root of the equation $x^3-2x+5=0$ correct to three decimal places by Bisection Method | 5 | 1 | 2 |
| | c. | Use the Method of False position, to find the fourth root of 32 correct to four decimal places and compute absolute, relative and percentage error. | 5 | 1 | 2 |
| | d. | Apply Gauss Jordan method to solve the equations:<br>$x+y+z=9;\quad 2x-3y+4z=13;\quad 3x+4y+5z=40$ | 5 | 4 | 2 |
| | e. | Find the rate of convergence of Newton Raphson Method. | 5 | 2 | 1 |
| **Section B ( 30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Derive the formula for Method of false position. Explain rate of Convergence and find the rate of convergence of Secant method. | 10 | 2 | 2 |
| | b. | Solve by Jacobi method $5x+y+z=4;\ x+7y+z=12;\ x+y+6z=-5$ | 10 | 4 | 1 |
| | c. | Solve by Gauss elimination method<br>$5x+y+z+u=4;\ x+7y+z+u=12;\ x+y+6z+u=-5;\ x+y+z+4u=-6$ | 10 | 4 | 1 |
| | d. | Find the root of the equation $x\log_{10}x=1.2$ using the Newton Raphson and Regula Falsi method correct to four decimal places. | 10 | 1 | 2 |

**Course Code:** SOS-B-MA403

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester**

## Department of Mathematics, SoS

**CC X: Linear Algebra- (Algebra-III) [03UG023]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

## Section A ( 20 marks)

Answer any 4 questions [05 x 04 marks=20 marks]

| | | | M | CO | KL |
|---|---|---|---|---|---|
| 1 | a. | Find the Eigen Values and Eigen Vectors of the given matrix $A=\begin{bmatrix}1 & 2 & 0\\ 1 & -2 & 1\\ 1 & 2 & 1\end{bmatrix}$. | 5 | CO1 | K2 |
| | b. | Define finite dimensional vector space and Find the rank of A by Echelon form method $A=\begin{bmatrix}1 & 5 & 7\\ -2 & -7 & -5\end{bmatrix}$ | 5 | CO2 | K2 |
| | c. | Find the non-trivial solution of the equations: $x + y - 6z = 0$, $-3x + y + 2z = 0$, $x - y + 2z = 0$. | 5 | CO1 | K3 |
| | d. | Define Skew Hermitian Matrix with example and also find whether the set of Vectors $V_1 = (0,2,0)$, $V_2 = (1,2,3)$, $V_3 = (-1,0,3)$ is linearly dependent or linearly independent. | 5 | CO3 | K2 |
| | e. | The necessary and sufficient condition for a non-empty subset W of a vector space V (F) to be a vector space V is $a,b \in F$ and $\alpha,\beta \in W \Rightarrow a\alpha + b\beta \in W$. | 5 | CO2 | K3 |

## Section B ( 30 marks)

Answer any 3 questions [03 x 10 marks=30 marks]

| | | | | | |
|---|---|---|---|---|---|
| 2 | a. | Show that the vectors {(2, 1, 4), (1,-1, 2) , (3,1,-2)} form a basis for $R^3$. Also express each of the standard basis vectors as linear combination of the above basis vectors. | 10 | CO3 | K3 |
| | b. | Solve the following equations by using Gauss Elimination Method: $x + 2y + 3z = 14$, $x + 2y + 3z = 7$, $x + y + 2z = 8$. | 10 | CO2 | K2 |

| | | | | | |
|---|---|---|---|---|---|
| | | AND also find the inverse of $A=\begin{bmatrix}1 & 2 & 1\\ 3 & 2 & 3\\ 1 & 1 & 2\end{bmatrix}$. | | | |
| | c. | Define Vector Space and Prove that the intersection of any two subspace of a vector space V (F) is also a subspace of V (F). | 10 | CO3 | K2 |
| | d. | Let $W_1$ be subspace of $V_4(R)$ generated by the set of vectors $S=\{(1,1,0,-1), (1,2,3,0),(2,3,3,-1)\}$ and Let $W_2$ be subspace of $V_4(R)$ generated by the set of vectors $T=\{(1,2,2,-2), (2,3,2,-3),(1,3,4,-3)\}$ Find: A. $\dim((W_1+W_2)$ B. $\dim((W_1 \cap W_2)$. | 10 | CO1 | K3 |

**Course Code: 03UG021**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester**

**B. Sc.(Hon.), Mathematics**

**Riemann Integration and Series of Functions (Analysis III) [SOS-B-MA402]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 20 marks)** | | | | | |
| Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | Define upper and lower Riemann sum and Riemann integral. | 5 | CO2 | 1 |
| | b. | Prove that if $f: [a, b] \to R$ be a bounded function and P is any partition of [a,b] then $L(P, f) \leq U(P, f)$ | 5 | CO2 | 2 |
| | c. | Show that if $f$ be a bounded function defined on [a,b] and m and M are infimum and supremum of $f$ then for every partition P $m(b-a) \leq L(P, f) \leq U(P, f) \leq M(b-a)$ | 5 | CO2 | 2 |
| | d. | Discuss the convergence of the integral $\int_1^\infty \frac{dx}{\sqrt{x}}$ | 5 | CO5 | 2 |
| | e. | Test the convergence of the integral $\int_1^\infty \frac{dx}{\sqrt{x^3+1}}$ | 5 | CO5 | 2 |
| **Section B ( 30 marks)** | | | | | |
| Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | State and prove necessary and sufficient condition of Riemann integrability. | 10 | CO1 | 3 |
| | b. | Prove that every continuous function is Riemann integrable. | 10 | CO3 | 3 |
| | c. | State and prove Fundamental theorem of integral calculus. | 10 | CO4 | 3 |
| | d. | Show that the integral $\int_0^\infty x^{(n-1)} e^{-x}\, dx$ is convergent if $n > 0$ | 10 | CO5 | 3 |

Course Code: SOS-B-CS402

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 4th Semester**

**SCHOOL OF SCIENCE**

**WEB & E-COMMERCE TECHNOLOGIES**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 20 marks)** Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | Describe Advantage and Disadvantage of E-Commerce. | 5 | 1 | 1 |
| | b. | Explain about E-Marketing. | 5 | 1 | 1 |
| | c. | What are the different Types of Issues Considered in E-Commerce? | 5 | 1 | 1 |
| | d. | What is World Wide Web? | 5 | 2 | 1 |
| | e. | Differentiate between Internet & Extranet. | 5 | 2 | 1 |
| **Section B ( 30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Discuss the Importance of Internet Evolution. | 10 | 2 | 2 |
| | b. | Evaluate the different Models of E-Commerce? | 10 | 1 | 2 |
| | c. | Explain Type of Networks. | 10 | 2 | 2 |
| | d. | Determine the role of Internet in B2B Application. | 10 | 2 | 2 |

**Course Code:** 03UG021

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 6th Semester**

**PHYSICS**

**ELECTROMAGNETIC THEORY [SOS-B-PH601]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Unit-I (20 marks)** Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | Derive first Maxwell equation of electromagnetism. Also give its physical significance. | 4 | 1 | 1 |
| | b. | Explain gauge transformation. | 4 | 1 | 2 |
| | c. | Find the equation for plane electromagnetic wave in free/vacuum space. | 4 | 1 | 2 |
| | d. | Define and find an expression is skin depth or penetration depth of electromagnetic wave in medium. | 4 | 2 | 1 |
| | e. | Prove that the electrical conductivity of ionized gas be $\sigma = \frac{-jNe^2}{m\omega}$ | 4 | 2 | 2 |
| **Unit-II (30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Write a review on Maxwell's equations. Also derive Maxwell third and fourth equations. | 10 | 1 | 3 |
| | b. | What is Lorentz and coulomb gauge. What is the physical significance of given transformation. | 10 | 1 | 3 |
| | c. | State and prove Poynting theorem. | 10 | 1 | 3 |
| | d. | Establish the electromagnetic wave equation for EM wave which propagate in conducting media. | 10 | 2 | 3 |
| | e. | Explain the behavior of Electromagnetic waves in plasma. | 10 | 2 | 3 |

**Course Code: B20CSOS02**

**O P JINDAL UNIVERSITY**

**Mid Semester Examination, April-2023**

**B.Sc. 6th Semester**

**STATISTICAL MECHANICS**

**[SoS-B-PH602]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 20 marks)**<br>Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | Explain Entropy and Thermodynamic Probability. Also, Prove that S = K log W. | 04 | CO-3 | K2 |
| | b. | Define Gibbs Paradox. Give an expression for it. | 04 | CO-3 | K2 |
| | c. | Define the Partition function and derivation for it. | 04 | CO-3 | K1 |
| | d. | Define the Postulates of Statistical Mechanics. | 04 | CO-1 | K1 |
| | e. | Explain Phase Space and its Types. | 04 | CO-1 | K1 |
| **Section B (30 marks)**<br>Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Distinguish between Maxwell Boltzmann, Bose-Einstein, and Fermi Dirac Statistics. | 10 | CO-3 | K1 |
| | b. | What do you understand about Phase Space? State and Prove Liouville's Theorem. | 10 | CO-1 | K2 |
| | c. | State and Prove Boltzmann Distribution law. | 10 | CO-3 | K2 |
| | d. | (i) Find the Probability of 4 different particles a b c d in two identical boxes.<br>(ii) At a given temperature 4.8 $*10^{-21}$ joule is the relativistic probability of the system being found in two states of energy difference. Calculate temperature. | 10 | CO-3 | K2 |

**Program Code: 03UG021**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 6th Semester Physics (Hons.)**

## School of Science

**Energy Materials [SOS-B-PH603 (iii)]**

**Time: 2 Hrs.** **Max. Marks: 50**

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Unit-I (20 marks)** Answer any 4 questions [04 x 05 marks=20 marks] | | | | | |
| 1 | a. | What is the importance of front contact in perovskite solar cell? Is optical fiber suitable for solar lighting applications? How? | 5 | CO3 | KL2 |
| | b. | What is solar radiation? What are three relevant bands of solar radiation? Which two bands of solar radiation are the majority in the total solar radiation reaching earth? How is solar energy radiated? | 5 | CO3 | KL1 |
| | c. | What is concentrating photovoltaics (CPV)? Explain. What are the advantages and disadvantages of CPV systems? | 5 | CO1 | KL1 |
| | d. | What are electroactive polymers? What is the main work principle of ionic EAP? | 5 | CO1 | KL2 |
| | e. | What is metamaterial? What are negative index metamaterial? | 5 | CO3 | KL1 |
| **Unit-II ( 30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | What are the parameters of a solar cell? Explain the IV curve, short circuit current, open circuit voltage, fill factor and solar cell efficiency with suitable graph. | 10 | CO3 | KL3 |
| | b. | What is crystalline silicon? Explain in detail the production of monocrystalline silicon wafers with suitable block diagram. | 10 | CO2 | KL2 |
| | c. | Explain the PV System Economics and Ecology in detail with desired factors. | 10 | CO2 | KL3 |
| | d. | What are piezoelectric materials? Why are piezoelectric materials of interest? Explain the mechanism of piezoelectric. Give their applications. | 10 | CO1 | KL2 |

Course Code: SOS-B-CH-601

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**BSc. 6th Semester**

**B.Sc. (Hons.)-Chemistry**

**Inorganic Chemistry- IV [03UG022]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 10 marks)** All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | Define organometallic compound with example. | 2 | 2 | 1 |
| | b. | Explain solubility product with example. | 2 | 1 | 1 |
| | c. | Draw the structure of $Fe_2(CO)_9$ and $[Mn(CO)_3Br]_2$. | 2 | 2 | 2 |
| | d. | Define Precipitation. | 2 | 1 | 1 |
| | e. | Define hepatcity. | 2 | 2 | 1 |
| **Section B ( 16 marks)** Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | Write notes on common ion effect with examples. | 4 | 1 | 2 |
| | b. | Explain interfering ions with suitable examples. | 4 | 1 | 2 |
| | c. | Define and classify the organometallic complexes on the basis of bond types. | 4 | 2 | 2 |
| | d. | Briefly explain the structure of metal carbonyls with structures. | 4 | 2 | 2 |
| | e. | Calculate the valance shell electron of following organometallic compounds:<br>• $[Fe(AsR_2)(CR_2)(CO)_3]$<br>• $[CpFe(PPh_3)_3Cl]$<br>• $[Cr\{CH(CH_3)_2\}(AsR_3)(CO)_4]$<br>• $[CpFe\ (CO)(PPh_3)(CF_2)]$ | 4 | 2 | 2 |
| **Section C ( 24 marks)** Answer any 3 questions [03 x 08 marks=24 marks] | | | | | |
| 3 | a. | Explain the principle involved in separation of cations and anions in detail. | 8 | 1 | 3 |
| | b. | Write the general methods of preparation of metal carbonyls with examples. | 8 | 2 | 2 |
| | c. | Calculate the number of M-M bond and per metal M-M bons in the following compounds and also draw their structure:<br>• $Os_4(CO)_{14}$<br>• $Ru_3(CO)_{12}$<br>• $Ir_4(CO)_{12}$<br>• $[Re_4(CO)_{16}]^{2-}$ | 8 | 2 | 3 |
| | d. | Explain in detail the principals involved in separation of cations into groups and choice of group reagents. | 8 | 1 | 2 |
| | e. | Explain the bonding in metal carbonyls on the basis of valance bond theory. | 8 | 2 | 3 |

Course Code: **SOS-B-CH-602**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 6th Semester**

**B.Sc. Chemistry (Hons)**

**Organic Chemistry [03UG022]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 10 marks)** All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | Define Dye and its type? | 2 | 5 | 1 |
| | b. | What do you mean by reducing sugar and non-reducing sugar? | 2 | 2 | 1 |
| | c. | Differentiate epimers and anomers? | 2 | 2 | 2 |
| | d. | What are vat dyes ? why it is called so? | 2 | 5 | 1 |
| | e. | Why carbohydrates are called as hydrates of carbon? | 2 | 2 | 2 |
| **Section B ( 16 marks)** Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | Explain chromophore-auxochrome theory of dyes? | 4 | 5 | 2 |
| | b. | Give classification of monosaccharides on the basis of no. of carbon and type of carbonyl group? | 4 | 2 | 3 |
| | c. | Elucidate the chromophore present in triphenylmenthane class of dye?give synthesis of malachite green | 4 | 5 | 1 |
| | d. | What do you mean by mordant dyes. Explain its type with example? | 4 | 5 | 1 |
| | e. | Explain the relative configuration of monosaccharides with example? | 4 | 2 | 2 |
| **Section C ( 24 marks)** Answer any 3 questions [03 x 08 marks=24 marks] | | | | | |
| 3 | a. | How can you prepare Nitrous acid? Give the mechanism of formation of diazonium salt from nitrosonium ion to generate dyes. | 8 | 5 | 2 |
| | b. | Explain the cyclization of D-Glucose ? | 8 | 2 | 2 |
| | c. | Explain the synthesis of alizarin from anthraquinone? State its properties | 8 | 5 | 2 |
| | d. | Why are direct dyes are also called "substantive dye"? List any four properties of direct dye? | 8 | 5 | 3 |
| | e. | Explain different types of linkage between dye and fibre along with example | 8 | 5 | 2 |

Course Code: **SOS-B-CH603 (iv)**

**O P JINDAL UNIVERSITY**

**Mid-Semester Examination, April-2023**

**B.Sc. 6th Semester**

**DSE III: Industrial Chemicals and Environment**

**[03 UG 023]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 10 marks)**<br>All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | Define Ecosystems with their types and suitable example. | 02 | CO 3 | K1 |
| | b. | To write uses of Pottash alum and KMnO4 | 02 | CO 1 | K1 |
| | c. | What are the uses of Helium and Neon. | 02 | CO 1 | K1 |
| | d. | What do you mean by pollution? Give some of the air and water pollutants name. | 02 | CO 3 | K1 |
| | e. | What is the components and function of ecosystem? | 02 | CO 3 | K1 |
| **Section B (16 marks)**<br>Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | Explain Biogeochemical cycles of carbon with their diagram. | 04 | CO 1 | K1 |
| | b. | To write manufacture, application and uses of nitric acid and sulphuric acid. | 04 | CO 1 | K1 |
| | c. | What do you mean by Acid Rain? To write their reason, sources and effect in daily life. | 04 | CO 3 | K1 |
| | d. | To explain uses, storage and application of Nitrogen and Hydrogen gas. | 04 | CO 1 | K2 |
| | e. | Define Food Chain and Food Web including various trophic levels with suitable examples. | 04 | CO 3 | K1 |
| **Section C ( 24 marks)**<br>Answer any 3 questions [03 x 08 marks=24 marks] | | | | | |
| 3 | a. | What is Water Pollution. To write their sources, effect and controlling method. | 08 | CO 3 | K1 |
| | b. | To write notes on: a) Ozone Depletion<br>b) Nitrogen Cycle | 08 | CO 3 | K1 |
| | c. | To write manufacture, application, analysis and uses of bleaching powder and Common salt. | 08 | CO 1 | K2 |
| | d. | Explain Air Pollution in atmosphere. To write their sources, effect and controlling method. | 08 | CO 3 | K1 |
| | e. | What is Industrial Gases? To explain uses, storage and application of oxygen , phosgene and chlorine gas. | 08 | CO 1 | K2 |

**Course Code: 03UG023**

**O P JINDAL UNIVERSITY**

**Mid Semester Examination, April-2023**

**B. Sc. 6th Semester**

**B. Sc.(Hon.), Mathematics**

**Metric Spaces and Complex Analysis(Analysis-IV[SOS-B-MA601]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 20 marks)** Answer any 4 questions [05 x 04 marks=20 marks] | | | | | |
| 1 | a. | Prove that $\tan^{-1}\frac{y}{x}$ is harmonic. | 05 | C06 | K1 |
| | b. | Determine the analytic function whose real part is $y + e^x \cos y$. | 05 | C07 | K1 |
| | c. | For what value of $z = sinucoshv + icosusinhv$ do the function $w = u + iv$ defined by the following equations ceases to be analytic? | 05 | C06 | K1 |
| | d. | Write Definition of Metric space and show that a mapping $d: X \times X \to R$ defined as $d(x,y) = \frac{\lvert x-y\rvert}{1+\lvert x-y\rvert}$ is metric on R. | 05 | CO1 | K2 |
| | e. | Prove that every convergent sequence $\{x_n\}$ in metric space converge to a unique limit. | 05 | CO1 | K2 |
| **Section B ( 30 marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | | | |
| 2 | a. | Define regular function and prove that If $f(z)$ is a regular function of $z$ , prove that $\nabla^2 \lvert f(z)\rvert^2 = 4\lvert f'(z)\rvert^2$. | 10 | CO7 | K2 |
| | b. | If $f(z)$ is an analytic function with constant modulus, show that $f(z)$ is constant. | 10 | C07 | K1 |
| | c. | Write definition of Closed sphere and closed set and prove that every closed sphere is closed set in metric space . | 10 | CO2 | K3 |
| | d. | Define complete metric space and prove that if (X, d) be a metric space and Y be a subspace of X then Y is complete if and only if Y is closed. | 10 | CO2 | K3 |

**Course Code: SOS-B-MA602**

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 6th Semester**

**MATHEMATICS**

**LINEAR PROGRAMMING [03UG023]**

**Time: 2 Hrs.** **Max. Marks: 50**

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Unit-I ( 10 marks)** All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | Define Linear Programming Problem.. | 2 | 1 | 1 |
| | b. | Define degenerate & non-degenerate basic feasible solution. | 2 | 1 | 1 |
| | c. | Define Slack and surplus variable with suitable example. | 2 | 1 | 1 |
| | d. | What is artificial basis technique? What is it's use? | 2 | 1 | 1 |
| | e. | Show that dual of the dual is primal. | 2 | 2 | 1 |
| **Unit-II ( 16 marks)** Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | A company manufactures two products A and B. Each unit of B takes twice as long to produce as one unit of A and if the company were to produce only A it would have time to produce 2000 units per day. The availability of the raw material is sufficient to produce 1500 units per day both A and B combined. Product B requiring a special ingredient only 600 units can be made per day. If A gives a profit of Rs. 2 per unit and B a profit of Rs. 4 per unit, formulate the LPP. | 4 | 1 | 2 |
| | b. | Reduce the following LPP to its standard form:<br>*Maximize* $z = x_1 - 3x_2$<br>*subject to* $-x_1 + 2x_2 \le 15$<br>$x_1 + 3x_2 = 10$<br>$x_1, x_2$ *unrestricted in sign* | 4 | 1 | 2 |
| | c. | Find the dual of the following LPP:<br>*Maximize* $z = 2x_1 + x_2$<br>*subject to* $x_1 + 5x_2 \le 10$<br>$x_1 + 3x_2 \ge 6$<br>$2x_1 + 2x_2 \le 8$<br>$x_2 \ge 0$ *and* $x_1$ *is unrestricted in sign* | 4 | 2 | 2 |
| | d. | Define degeneracy. Write the procedure to resolve the degeneracy. | 4 | 1 | 1 |
| | e. | Solve using graphical method: | 4 | 1 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| | | *Maximize* $z = 6x_1 + 4x_2$<br>*subject to* $-2x_1 + x_2 \le 2$<br>$x_1 - x_2 \le 2$<br>$3x_1 + 2x_2 \le 9$<br>$x_1, x_2 \ge 0$ | | | |
| **Unit-III ( 24 marks)**<br>Answer any 3 questions [03 x 08 marks=24 marks] | | | | | |
| 3 | a. | Solve the following LPP using Simplex method:<br>*Maximize* $z = 3x_1 + 2x_2 + 5x_3$<br>*subject to* $x_1 + 2x_2 + x_3 \le 430$<br>$3x_1 + 2x_3 \le 460$<br>$x_1 + 4x_3 \le 420$<br>$x_1, x_2, x_3 \ge 0.$ | 8 | 1 | 2 |
| | b. | Solve the following LPP using Simplex method:<br>*Maximize* $z = 2x_1 + x_2$<br>*subject to* $4x_1 + 3x_2 \le 12$<br>$4x_1 + x_2 \le 8$<br>$4x_1 - x_2 \le 8$<br>$x_1, x_2 \ge 0.$ | 8 | 1 | 2 |
| | c. | Solve the LPP using Big M method:<br>*Minimize* $z = 12x_1 + 20x_2$<br>*subject to* $6x_1 + 8x_2 \ge 100$<br>$7x_1 + 12x_2 \ge 120$<br>$x_1, x_2 \ge 0.$ | 8 | 1 | 2 |
| | d. | Using dual simplex method to solve:<br>*Maximize* $z = -3x_1 - x_2$<br>*subject to* $x_1 + x_2 \ge 1$<br>$x_1 + 3x_2 \ge 2.$<br>$x_1, x_2 \ge 0$ | 8 | 2 | 2 |
| | e. | Apply the principle of duality to solve the LPP:<br>*Maximize* $z = 3x_1 + 2x_2$<br>*subject to* $-x_1 - x_2 \ge -1$<br>$x_1 + x_2 \le 7$<br>$x_1 + 2x_2 \le 10$<br>$x_2 \le 3$<br>$x_1, x_2 \ge 0$ | 8 | 2 | 2 |

Course Code: SOS-B-MA603(ii)

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. 6th Semester**

**Mathematics**

**PROBABILITY & STATISTICS [03UG023]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note: Scientific Calculator is allowed.

| | | | M | CO | KL |
|---|---|---|---|---|---|
| **Section A ( 10 marks)** | | | | | |
| All Questions are compulsory [05 x 02 marks=10 marks] | | | | | |
| 1 | a. | Define conditional probability and write the statement of Baye's Theorem. | 2 | 1 | 1 |
| | b. | Define independent event and give a suitable example. | 2 | 1 | 1 |
| | c. | If X is the number of points rolled with a balanced die, find the expected value of $g(X)=2X^2+1$ | 2 | 3 | 1 |
| | d. | Define joint distribution function and joint probability density function. | 2 | 2 | 1 |
| | e. | If the random variables $X$, $Y$, and $Z$ have the means 2, -3, 4 and the variances 1, 5, 2. The covariances are cov($X$, $Y$)= -2, cov($X$, $Z$)= -1 and cov($Y$, $Z$)= 1. Find the mean and the variance of $W=3X-Y+2Z$ | 2 | 2 | 1 |
| **Section B ( 16 marks)** | | | | | |
| Answer any 4 questions [04 x 04 marks=16 marks] | | | | | |
| 2 | a. | Find the distribution function of the total number of heads obtained in four tosses of a balance coin. | 4 | 2 | 2 |
| | b. | If X has the probability density $f(x)=\begin{cases} k\cdot e^{-3x}, & for\ x>0 \\ 0, & elsewhere \end{cases}$ Find $k$ *and* $P(0.5\le X\le 1)$ | 4 | 2 | 2 |
| | c. | Given the joint probability density $f(x,y)=\begin{cases} \frac{2}{3}(x+2y), & for\ 0<x<1,\ 0<y<1 \\ 0, & elsewhere \end{cases}$ Find the marginal densities of X and Y | 4 | 2 | 2 |
| | d. | If the joint probability density of $X$ and $Y$ given by $f(x,y)=\begin{cases} \frac{2}{3}(x+2y), & for\ 0<x<1,\ 0<y<1 \\ 0, & elsewhere \end{cases}$ Find the conditional mean and the conditional variance of $X$ given by $Y=1/2$ | 4 | 4 | 2 |
| | e. | If $X$ has the discrete uniform distribution $f(x)=1/k$, for $x$ = 1, 2, 3, …, $k$, show that (i) Its mean is $(k+1)/2$ (ii) Its variance is $(k^2-1)/12$ | 4 | 3 | 2 |

## Section C ( 24 marks)

Answer any 3 questions [03 x 08 marks=24 marks]

| | | | | | |
|---|---|---|---|---|---|
| 3 | a. | Five coins are tossed 3,200 times, find the expected frequencies of the distribution of heads and tails, and tabulate the result. Calculate mean number of heads and standard deviations. | 8 | 2 | 2 |
| | b. | State and prove Chebyshev theorem | 8 | 3 | 2 |
| | c. | Explain moment generating function of Binomial distribution and find its mean and variance from it. | 8 | 5 | 2 |
| | d. | Calculate the mean, median, mode, mean deviation and standard deviation for the following data.<br>Class Interval: 0-10 10-20 20-30 30-40 40-50 50-60 60-70<br>Frequency: 4 8 11 15 12 6 3 | 8 | 4 | 3 |
| | e. | Two caplets are selected at random from a bottle containing 3 aspirin, 2 sedative and 4 laxative caplets. If X and Y are, respectively, the numbers of aspirin and sedative caplets included among the 2 caplets drawn from the bottle.<br>(i) Find the probability distribution of X and Y<br>(ii) Find the conditional distribution of X given Y=1<br>(iii) Find the Covariance of X and Y | 8 | 3 | 3 |

Course Code: SOS-B-VA-601

# O P JINDAL UNIVERSITY

**Mid Semester Examination, April-2023**

**B.Sc. (H)- 6th Semester**

**SCHOOL OF SCIENCE**

**PUBLIC ADMINISTRATION [03UG021]**

**Time: 2 Hrs.** **Max. Marks: 50**

Note:

| | | | M | CO | KL |
|---|---|---|---|---|---|
| | | **Section A (20 Marks)** Answer any 4 questions [04 x 05 marks=20 marks] | | | |
| 1 | a. | What do you mean by Administration? Discuss in brief the elements of Administration. | 5 | 1 | 1 |
| | b. | Define the term public administration and explain its nature and scope. | 5 | 1 | 1 |
| | c. | What do you mean by Modern Public Administration? Discuss in brief its salient features. | 5 | 1 | 1 |
| | d. | What do you mean by Good Governance? Write the characteristics of Good Governance. | 5 | 1 | 2 |
| | e. | What are the Building Blocks of organizational structure? Discuss. | 5 | 2 | 1 |
| | | **Section B (30 Marks)** Answer any 3 questions [03 x 10 marks=30 marks] | | | |
| 2 | a. | Discuss in detail the Role of Public Administration. | 10 | 1 | 1 |
| | b. | Compare and contrast public administration and private administration. | 10 | 1 | 2 |
| | c. | What are the advantages and disadvantages of Centralisation and decentralization? Explain with examples. | 10 | 2 | 2 |
| | d. | What do you mean by Unity of Command? Discuss the impact of Unity of Command. | 10 | 2 | 1 |