ALL THE BEST
to all II PU students
II PU KEY ANSWER
PHYSICS
ಎಸ್.ಆರ್.ಎಸ್ ಪದವಿ ಪೂರ್ವ ಕಾಲೇಜು
ಹೊಸಪೇಟೆ ರಸ್ತೆ, ಚಿತ್ರದುರ್ಗ
20-March -2023
SRS PU COLLEGE
Hosapet Road, Chitradurga

Sub Code: 33 **Sub: PHYSICS** **Max Marks: 70**
Time: 3 Hrs. 15 Min **No. of Questions: 48**

PART –A

I. Pick the correct option among the four given options for ALL of the following questions: $15 \times 1 = 15$

1. (a) Electric Charge
2. (c) Electrostatic shielding
3. (c) Water molecule
4. (a) Mobility
5. (b) Cyclotron
6. (a) Gauss's law in magnetism
7. (a) Henry
8. (d) Becomes four times
9. (a) $I = \frac{i_m}{\sqrt{2}}$
10. (a) X-ray region and visible region
11. (c) $i = 0^o$
12. (c) Plane wave front
13. (a) Wave nature of electrons
14. (a) Slow down the fast neutrons
15. (a) $E_g = 0$

II. Fill in the blanks by choosing appropriate answer given in the bracket for ALL the following questions: $5 \times 1 = 5$

16. Electric dipole
17. Curie temperature
18. Transverse
19. Isotopes
20. Zener diode

PART - B

III. Answer any FIVE of the following questions. $5 \times 2 = 10$

21. Area of plates, distance between plates
22. It states that the line integral of magnetic field $\vec{B}$ around a closed path in vacuum is equal to μ_0 times the total current threading the closed paths. $\oint \vec{B} \cdot d\vec{l} = \mu_0 I$
23. The angle between direction of earth's magnetic field and the horizontal component of earth's magnetic field in the magnetic meridian at a place is called inclination or magnetic dip.

    The angle between the magnetic meridian and geographic meridian at a place is called declination.

24. When bulk pieces of conductors are subjected to changing magnetic flux, induced current are produced in them. These currents are called eddy currents.
    Uses: Induction furnace
25. Loss due to flux leakage, Loss due to eddy currents
26. Current that result due to the time rate of change of electric flux is called displacement current.

    Displacement current $I_d = \varepsilon_0 \frac{d\phi_E}{dt}$

    ε_0 = Permittivity of free space, $\frac{d\phi_E}{dt}$ = rate of change of electric flux

27. The limit of resolution of a telescope is given by $d\theta = \frac{1.22\lambda}{a}$ where λ is the wavelength of light used. d is the diameter of the objective of telescope.

28. (a) Lymann series
(b) Balmer series

29.

Nuclear fission	Nuclear fusion
1. A process in which heavy nucleus splits into two nuclei of comparable masses along with release of few neutrons and energy is known as fission. 2. Energy released per fission is large.	1. A process in which two lighter nuclei combine to form a single heavy nucleus along with the release of energy is known as fusion. 2. Energy released per fusion is less

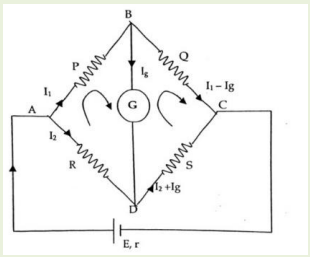
PART - C

IV. Answer any FIVE of the following questions $5 \times 3 = 15$

30.

- Electric field lines diverge from a positive charge and converge at negative charge.
- They are normal to the surface of charged conductor, when the charges are in equilibrium.
- Electric field lines never intersect.

31.



$\frac{P}{Q} = \frac{R}{S}$.

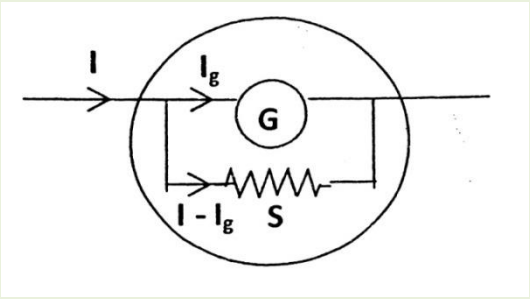
32. A galvanometer is converted into an ammeter by connecting a low resistance in parallel with it. Let G be the resistance of the galvanometer, I_g be the current required for full scale deflection and S be the low resistance to be connected in parallel to the galvanometer.
If I is the maximum current to be measured then by the branch current formula

$I_g = \frac{IS}{G+S}$ ------(1)

$I_gG + I_gS = IS$

$(I - I_g)S = I_gG$

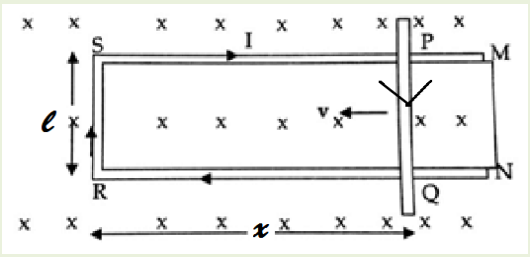
$S = \frac{I_gG}{I-I_g}$



33.

Diamagnetic	Paramagnetic
i) In non-uniform magnetic field they tend to move form stronger to weaker region of the field. ii) These substances are weakly repelled by a strong magnet. iii) Susceptibility is low and negative.	i) In non-uniform magnetic field they tend to move from weaker to stronger region of the field. ii)These substances are weakly attracted by a strong magnet. iii) Susceptibility is low and positive.

34. Consider a rectangular conductor PQRS in which the conductor PQ is free to move. The rod PQ is moved towards the left with a constant velocity v. Rectangular conductor is placed in the magnetic field which is perpendicular to the plane of the paper and into it as shown in the figure.If the length RQ=x and RS=l, the magnetic flux enclosed by the loop PQRS is



$\emptyset = BA\,\text{Cos}\theta = \text{B}l\text{x} \quad \theta = 0^0$

$\varepsilon = -\frac{\text{d}\emptyset}{\text{dt}} = -\frac{d}{dt}(Bl\text{x})$

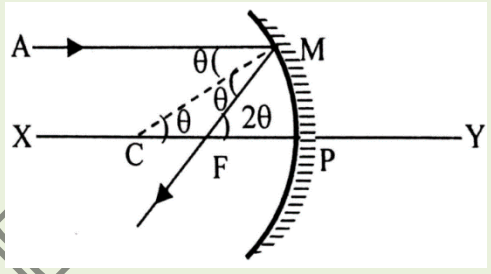
Induced emf $\varepsilon = -Bl\left(\frac{\text{dx}}{\text{dt}}\right)$.

But $\frac{\text{dx}}{\text{dt}} = -\text{v}$

$\therefore$ Magnitude of the induced emf $\varepsilon = Bl\text{v}$.

35. Let us consider a concave mirror of pole P,center of curvature C and focus F.Let the focal length f and radius of curvature R.

AM is incident ray,MF is reflected ray and MC is normal



From ΔMCP, $\tan\theta = \frac{\text{MP}}{\text{CP}}$

from ΔMFP, $\tan 2\theta = \frac{\text{MP}}{\text{FP}}$

Since θ is very small $\tan\theta \approx \theta$ and

$$\tan 2\theta \approx 2\theta$$

$\therefore \theta = \frac{\text{MP}}{\text{CP}}$ and $2\theta = \frac{\text{MP}}{\text{FP}}$ **or** $\theta = \frac{\text{MP}}{2\text{FP}}$

$\therefore \text{CP} = 2\text{FP} \;\therefore \text{R} = 2\text{f}$ **or** $\text{f} = \frac{\text{R}}{2}$

36. Bohr's model is based on the following postulates

(a) Every electron revolve around the nucleus in circular orbits which are called stationary orbital's. The necessary centripetal force is provided by the electrostatic force of attraction between the nucleus and the electron.

$i.e. \frac{mv^2}{r} = \frac{1}{4\pi\epsilon_0}\frac{Ze^2}{r^2}$

Where m and v is the mass and velocity of the electron respectively, r is the radius of the orbit and Z is the atomic number

(b) Electron revolve only in those orbits for which angular momentum is integral multiple of $\frac{h}{2\pi}$ $\text{mvr} = n\frac{h}{2\pi}$ where $n = 1,2,3,\ldots\ldots\infty$

where n is called principal quantum number h is planks constant.

(c) When an electron jumps from one orbit to another orbit energy is absorbed or released which is equal to the difference between the energies of two orbits

i.e. $hv = E_i - E_f$

37. Mass defect $\Delta m = \left[Zm_p + (A-Z)m_n\right] - M$

For ${}_2He^4$ $Z = 2$

$A - Z = 4 - 2 = 2$

$\Delta m = 2(1.00727) + 2(1.00866) - 4.00260$

$\Delta m = 2.01454 + 2.01732 - 4.00260$

$\Delta m = 4.03186 - 4.00260$

$\Delta m = 0.02926u$

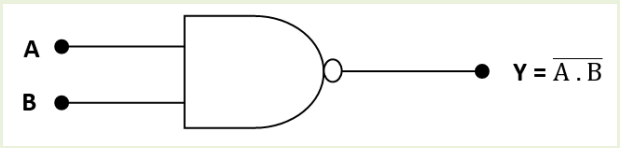
Binding energy $= \Delta m \times 931.5M\,eV$

$= 0.02926 \times 931.5M\,eV$

$= 27.25569M\,eV$

38.

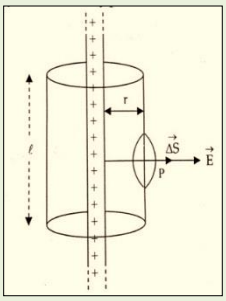
A	B	$Y = \overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0



PART – D

V. Answer any THREE of the following questions **$3 \times 5 = 15$**

39.



Consider a straight conductor of infinite length of uniform linear charge density λ. Let P be a point at the distance r from the conductor. Let $\vec{E}$ be the electric intensity at P. Consider Gaussian surface in the form of cylinder as shown in the diagram.

Flux through the circular cross section of the cylinder

$\emptyset = 0$ as $\theta = 90^0$

Let dS be the small surface area around the point P on the curved surface of the cylinder.

Flux through dS is given by

$d\emptyset = \vec{E} \cdot \overrightarrow{dS}$

$d\emptyset = E\, dS \cos\theta$

$d\emptyset = E(dS)$ $\theta = 0^0$

Total electric flux through curved surface

$\emptyset = \int E\, ds$

$\emptyset = E\int ds$

$\emptyset = E(2\pi r l)$ -----(1)

According to Gauss theorem

$\emptyset = \frac{1}{\varepsilon_0} q$ where $q = \lambda l$

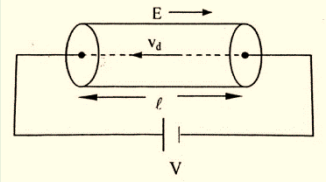
$\therefore \emptyset = \frac{1}{\varepsilon_0}(\lambda l)$------(2)

From (1) and (2), $E\,(2\pi r l) = \frac{1}{\varepsilon_0}(\lambda l)$

$E = \frac{1}{2\pi\varepsilon_0}\frac{\lambda}{r}$

This is the expression for electric field intensity due to infinite long conductor.

40.



Consider a conductor of length l and area of cross section A. Let a p.d. of V be applied across its ends.

Then drift velocity is

$v_d = a\tau = \frac{Ee\tau}{m} - - - -(1)$

Current flowing through the conductor is $I = nAeV_d - - - (2)$

n→number of free electrons per unit volume

e→charge on an electron,

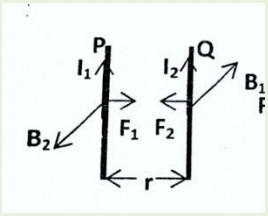
Sub(1) in (2), i.e, $I = nAe\left(\frac{Ee\tau}{m}\right) = \left(\frac{n\,A\,e^2\,\tau}{m}\right)E$ or $\frac{I}{A} = \left(\frac{ne^2\tau}{m}\right)E$.

$J = \left(\frac{ne^2\tau}{m}\right)E$

$\therefore \sigma E = \left(\frac{ne^2\tau}{m}\right)E. \quad (J = \sigma E)$

$\therefore \sigma = \left(\frac{ne^2\tau}{m}\right).$

41.



Let P and Q be two long straight parallel conductors carrying currents I_1 and I_2 in the same direction. Let r be the distance between the two conductors. The magnetic field at any point on Q due to the current in p is,

$B_1 = \frac{\mu_0 I_1}{2\pi r}$ ------(1)

Due to this magnetic field, the conductor Q experiences a mechanical force which is given by

$F_2 = B_1 I_2 L \sin\theta$

where L is the length of the conductor.

$F_2 = B_1 I_2 L \quad \because \theta = 90^0$

$F_2 = \frac{\mu_0 I_1 I_2 L}{2\pi r}$ [from (1)]-------(2)

Similarly force experienced by P due to the magnetic field by Q is

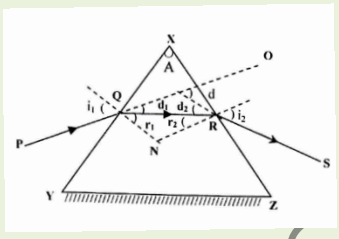
$F_1 = \frac{\mu_0 I_1 I_2 L}{2\pi r}$ -----(3)

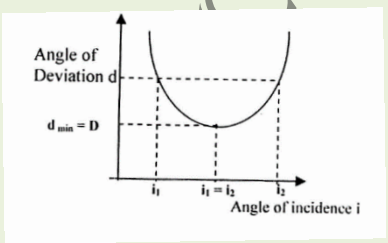
From equation (2) and (3), $F_1 = F_2$

∴ Force per unit length of the conductor is $F = \frac{F_1}{L} = \frac{F_2}{L} = \frac{\mu_0 I_1 I_2}{2\pi r}$

One ampere is defined as that steady current which when maintained through two infinitely long straight parallel conductors placed one metre apart in free space exerts a force of 2×10^{-7} Newton per metre length on each other.

42.





Let XYZ be the principle section of a prism of refractive index n and refracting angle A. A ray incident along PQ on the face XY after refraction emerges along RS. Let i_1 and $r_1$be the angle of incidence and angle of refraction at the surface XY. r_2 and $i_2$be the Angle of incidence and angle of emergence at the surface XZ respectively.

The deviation produced by the face XY is

$d_1 = i_1 - r_1$

The deviation produced by the face XZ is

$d_2 = i_2 - r_2$

∴ Net deviation produced by the prism for the ray of light is

$d = d_1 + d_2 = (i_1 - r_1) + (i_2 - r_2)$

$d = (i_1 + i_2) - (r_1 + r_2) - - - (1)$

From theΔQNR,

$r_1 + r_2 + \angle QNR = 180^0 - - - -(2)$

In quadrilateral XQNR,

$A + \angle QNR = 180° - - - -(3)$

From (2) and (3), $A = r_1 + r_2 - - - -(4)$

∴ Equation (1) becomes,

$d = i_1 + i_2 - A - - - -(5)$

From equation (5), we find that for a given value of deviation d there values of angles of incidence namely i_1 and i_2.

The graph showing the variation of angle incidence is shown above. At minimum deviation d = D; $i_1 = i_2 = i$; $r_1 = r_2 = r$

∴ Eqn (4) $A = r_1 + r_2$ becomes, $A = 2r \quad r = \frac{A}{2}$

∴ Equation (5) becomes $D = 2i - A$

$$2i = A + D$$

$$i = \frac{A+D}{2}$$

∴ Refractive index of the material of the

$$\text{Prism } n = \frac{\sin i}{\sin r}$$

$$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

This is the expression for refractive index of prism material.

43. **(a)** The phenomenon in which electrons are emitted from the metal surface when it is illuminated by light of suitable frequency is called photoelectric effect.

(b) The minimum energy required to liberate an electron from the metal surface is called the work function (Φ_0) of the metal.

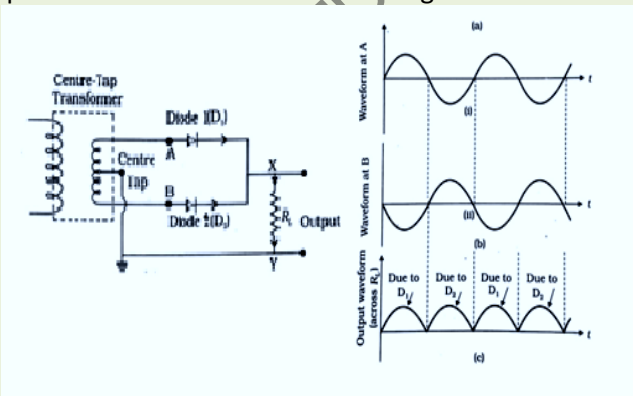
(c) (i) The photoelectric current is directly proportional to the intensity of incident light, above threshold frequency

(ii) For a given metal, there exists a certain minimum frequency of the incident radiation below which no emission of photoelectrons takes place. This frequency is called threshold frequency.

(iii) For a given photo sensitive material and frequency of incident radiation saturation current is found to be proportional to the intensity of incident radiation and stopping potential is independent of intensity.

44. Rectifier :

"The process of conversion of alternating current to direct current is called rectification."



Working: On application of AC voltage across the primary, a voltage is induced across the secondary of the transformer.During +ve half cycle of AC input the diode D_1 gets forward biased and conducts while D_2being reverse biased is not conducting. So the output current flows through R_L as shown in the fig.During –ve half cycle of AC input D_2 conducts and D_1 does not conduct. Again current flow through R_L as shown in the fig. Thus there is current flow through R_L over the complete cycle of AC input in the same direction. The input and output waveforms are as shown in the graph.

VI. Answer any <u>TWO</u> of the following questions **$2 \times 5 = 10$**

45. The total potential at the centre of the square is zero

$V = V_A + V_B + V_C + V_D$

$0 = \frac{1}{4\pi\varepsilon_0 \frac{x}{\sqrt{2}}}[q_A + q_B + q_C + q_D]$

$2 \times 10^{-6} + 4 \times 10^{-6} + 6 \times 10^{-6} + q_D = 0$

$q_D = -12 \times 10^{-6} C$

46. The effective resistance for parallel combination

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$\frac{1}{R_p} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$

$\frac{1}{R_p} = \frac{6+4+2}{12}$

$R_p = \frac{12}{12} = 1\Omega$

$emf\ of\ the\ cell\ (E) = 2V$

Current passing through the R_1 is $I_1 = \frac{E}{R_1} = \frac{2}{2} = 1A$

Current passing through the R_2 is $I_2 = \frac{E}{R_2} = \frac{2}{3} = 0.67A$

Current passing through the R_3 is $I_3 = \frac{E}{R_3} = \frac{2}{6} = 0.33A$

Total Current passing through the circuit is $I = I_1 + I_2 + I_3$

$I = 1 + 0.67 + 0.33$

$I = 2A$

47. Peak voltage $(V_0) = 283V$

Frequency $(f) = 50Hz$

Resistance $(R) = 3\Omega$

Inductance $(L) = 25.48 \times 10^{-3}\ H$

Capacitance $(C) = 796 \times 10^{-6}\ F$

a) Impedance of the circuit $(Z) = \sqrt{R^2 + (X_L - X_C)^2}$

Angular frequency $(\omega) = 2\pi f$

$\omega = 2 \times 3.14 \times 50$

$\omega = 314\ rad/s$

Inductive reactance $(X_L) = \omega L$

$X_L = 314 \times 25.48 \times 10^{-3}$

$X_L = 8\Omega$

Capacitive reactance $(X_C) = \frac{1}{\omega C}$

$X_C = \frac{1}{314 \times 796 \times 10^{-6}}$

$X_C = \frac{1 \times 10^6}{249944}$

$X_C = 4\Omega$

Impedance of the circuit $(Z) = \sqrt{R^2 + (X_L - X_C)^2}$

$Z = \sqrt{(3)^2 + (8-4)^2}$

$Z = \sqrt{9 + 16}$

$Z = \sqrt{25} = 5\Omega$

b) The phase difference between the voltage across the source and current is

$$tan\Phi = \frac{X_L - X_C}{R}$$
$$tan\Phi = \frac{8-4}{3}$$
$$tan\Phi = \frac{4}{3}$$
$$\Phi = 53.13^0$$

48. Distance between the slits $(d) = 0.18 \times 10^{-3}m$

$$d = 18 \times 10^{-5}m$$

Fringe width $(\beta) = 2.7 \times 10^{-3}m$

Distance between the slit and screen $(D) = 0.8m$

Fringe width $(\beta) = \frac{\lambda D}{d}$

a) Wavelength of the light used $(\lambda) = \frac{\beta d}{D}$

$$\lambda = \frac{2.7\times10^{-3}\times18\times10^{-5}}{0.8}$$
$$\lambda = 60.75 \times 10^{-8}$$
$$\lambda = 607.5 \times 10^{-9}m$$
$$\lambda = 607.5nm$$

b) The wavelength of replaced source $(\lambda^1) = 450 \times 10^{-9}m$

The change in fringe width $\Delta\beta = \beta - \beta^1$

$$\Delta\beta = \frac{(\lambda - \lambda^1)D}{d}$$
$$\Delta\beta = \frac{(6.075-4.5)\times10^{-7}\times0.8}{18\times10^{-5}}$$
$$\Delta\beta = 0.07 \times 10^{-2}m$$
$$\Delta\beta = 7 \times 10^{-4}m$$

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555	554	553	546
544	542	542	541
540	540	540	540
540	539	536	534
532	531	530	529
528	527	526	526
525	524	521	521
519	516	515	515
515	507	503	502
502	497	495	495
494	492	490	489
488	484	482	480
480	480	476	476
475	474	473	471
465	464	463	462
461	461	457	455
455	454	452	451
450	450	450	

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2	VITEEE	31 Mar	Vellore Institute Of Technology	https://viteee.vit.ac.in
3	JEE Mains (slot II)	12 Mar	National Testing Agency	https://jeenta.in
4	BITSAT	09 Apr	Birla Institute of Technology and Science	https://bitsat.cbexams.com
5	COMED-K	24 Apr	Karnataka Professional Colleges Foundation	https://www.comedk.org
6	AIFSET Forensic Science	25 Mar	All India Forensic Science Entrance Test	www.aifset.com
7	NEET	06 Apr	National Testing Agency	https://medicalnta.in
8	CA-Foundation	01 July	The Institute of Chartered accountants of India	https://www.icai.org
9	MET	22 May	Manipal Entrance Test	https://manipal.edu/datestoremember
10	ICAR	30 Mar (Extended Duration)	National Testing Agency	https://cuet.samarth.ac.in

SRS NEET/ K-CET

CRASH COURSE-2023

Begins from - 24 March

SRS- We lead the way you aspire to go...

SRI SRI RANGANATHA SWAMY EDUCATIONAL SOCIETY ®

SRS PU COLLEGE, CHITRADURGA

Committed to carve the path of success…

NEET | K-CET CRASH COURSE -2023

- Result-Oriented & highly Organized Coaching for sure success
- 52 days for **K-CET & JEE** and 36 days for **NEET**
- Everyday 90 minute session for **K-CET** in each subject.
- Everyday 120 minute session for **NEET & JEE** in each subject.
- Every fourth day is cumulative test of excellence.
- Counselling, Subject wise performance analysis to motivate the students to excel in **NEET/ K-CET**
- Result of test of excellence is announced on the same day.
- Tests of Excellence are followed by 15 exclusively designed Grand tests at the end for **K-CET**
- Tests of Excellence are followed by 10 exclusively designed Grand tests at the end for **NEET & JEE**
- Training in Practical's for BSc. Agri., Horticulture, Vet. Science, Etc... Is also given for 15 Days for 200 Marks.
- Assistance for additional exams is also given.
- Resource persons are from various places.
- Holidays for all students on **K-CET** exam days.

COURSE COMMENCES ON 25 – March - 2023

(COMPUTER SCIENCE students can join after their BOARD EXAM)

Detailed schedule with all topics, time, date and tests is given on the first day of commencement. College has an efficient teaching Brigade & the best of study and reference material. We do not engage in an experimental kind of work properly planned Schedule with an efficient teaching and practice have yielded us very good results. College has evolved its best Coaching Expertise in its 14 years of service.

SCHEDULE-01
Teach- test & discuss method with practice sessions.

SCHEDULE-02
Grand Test everyday- Test paper discussion & additional DPP discussion with extended practice

SRS has designed both schedules carefully to expose Students to competitive ambience. Students have to be prepared to choose any one. Shifting from one to the other is not entertained.

Date of K-CET	Date of NEET	Date of JEE (II slot) Mains	Date of JEE Advanced
21 & 22 May	07 - May	07 to 12 April	06 June

Register online @ www.srspucollege.in | 9900000811,

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