FY - BA / B.Sc & B.Com

20220422 FCASC 201 F.C

Foundation Course SEM II April 2022
FYBA/BSc/Bcom
Part A

Total Marks: 75 **Time: 2hrs 30min**

1. Freedom to business enterprises from excessive government control means _____.
   a. Privatisation
   b. Globalization
   c. Liberalisation
   d. Disinvestment
2. _____is working with farmers by corporate firms & sharing the rewards.
   a. Corporate farming
   b. Private farming
   c. Cooperatives farming
   d. Contract farming
3. As per the new industrial policy, licensing is required only in ____ industries.
   a. Seven
   b. Two
   c. Six
   d. Ten
4. Farmer's suicide is the highest in the state of _____.
   a. Punjab
   b. Maharashtra
   c. MP
   d. UP
5. Economic liberalization was a bold decision by the Prime Minister _____.
   a. Narsimha Rao
   b. Rajiv Gandhi
   c. Bajpai
   d. Modi
6. The concept of liberalization, Privatization and Globalization gained prominence in the late _____ century.
   a. 18th
   b. 20th
   c. 19th
   d. 21st
7. The _____ initiative of the government advocates the reduction in dependents on imports of foreign technology.
   a. Made in China
   b. Privatization
   c. LPG
   d. Make in India
8. Human rights are derived from the principle of ____.
   a. Government law
   b. Judicial law
   c. Natural law
   d. Human law

P.T.O

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P.T.O

9. Article 15 of the constitution provides _____ equality & equal access to public area.

a. Religious
b. Social
c. Political
d. Economic

10. Human rights are those conditions of_____ life without which no man can seek in general to be at his best.

a. Personal
b. Individual
c. Self
d. Social

11. _____has made primary education as a fundamental right.

a. Educational rights
b. Political rights
c. Right to education
d. Social rights

12. _____empowers the citizens to move court of law.

a. Liberty
b. Right to Constitutional remedies
c. Political Liberty
d. Legal Liberty

13. Human rights in a more specified and well defined manner came with the signing of _____.

a. Magna Carta
b. Covenant
c. Agreement
d. Treaty

14. UDHR was adopted by the UN general assembly on _____.

a. 8th December 1948
b. 6th December 1948
c. 10th December 1948
d. 12th December 1948

15. _____ is the abiotic and biotic elements that surround humans.

a. Ecological
b. Environment
c. Ecology
d. Ecosystem

16. _____environment provides scope for tourism.

a. Social
b. Political
c. Personal
d. Natural

17. _____development focuses on improving the quality of human life without much use of natural resources.

a. Sustainable
b. Political
c. Social
d. Economic

P.T.O

18. The _____is the layer of gases surrounding our planet.

a. Atmospheric
b. Biodiversity
c. Biosphere
d. Atmosphere

19. In an ecosystem, the _____are primary producer.

a. Human
b. Plants
c. Animal
d. Technology

20. Population Ecology is a major sub-field of _____.

a. Demography
b. Environment
c. Ecology
d. Biology

21. In the name of development the activities of human being have resulted in _____.

a. Urbanization
b. Environmental degradation
c. Industrialization
d. Globalization

22. The _____ stressors are also known as job- related stressors.

a. Organizational
b. Job
c. Work
d. Companies

23. The family influences a person's _____through mirror Image of him/herself.

a. Personality
b. Self
c. Self-concept
d. Self-image

24. _____ provide moral principles and rules of good conduct to be followed by individuals in a society

a. Values
b. Society
c. People
d. Ethics

25. When a person does not know what he is supposed to do on the job _____occurs.

a. Role conflicts
b. Role confusion
c. Role ambiguity
d. Role problem

P.T.O

26. _____ means pre - judgment.

a. Prejudice
b. Inequalities
c. Violence
d. Conflict

27. _____ is a state of imbalance arising due to excessive psychological or physiological demands on a person.

a. Eustress
b. Stress
c. Stressors
d. Conflict

28. Any behaviour intended to harm another person is called as _____.

a. Conflict
b. Anger
c. Aggression
d. Angry

29. _____ conflict takes place within an individual.

a. Interpersonal
b. Intergroup
c. Intra group
d. Intrapersonal

30. There should be proper _____ to avoid work overload.

a. Work management
b. Time management
c. Meditation
d. Exercise

31. _____are people who take the initiative to address the conflict and try to resolve it.

a. Confronters
b. Concealers
c. Addressers
d. Avoiders

32. _____is the conflict management strategy which eliminates the conflict by having both individuals lose something.

a. Win / lose strategy
b. Lose/ lose strategy
c. Win / win strategy
d. Win lose / win lose strategy

33. Maslow identified _____ set of needs.

a. Five
b. Four
c. Two
d. Three

34. Who identified the theory of Self- Actualization?

a. Abraham
b. Nadler
c. Comte
d. Abraham Maslow

35. Proper _____ management can reduce the stress caused due to work overload.

a. Event
b. Personality
c. Time
d. Work

P.T.O

20220422 FCASC201

Part B

Figures to the right indicate full marks.

Q1. Illustrate on causes and effects of Migration. 08

OR

Write a detailed note on Farmers Suicide in India. 08

Q2. Define Human Rights. Examine various features of Human Rights. 08

OR

Explain Article 19 (1) (a) Freedom of Speech and Expression with restrictions on it. 08

Q3. Highlight various causes of environmental degradation. 08

OR

Define Sustainable Development. Examine the need for Sustainable Development. 08

Q4. Examine Organizational Stressors. 08

OR

Explain different Agents of Socialization. 08

Q5. What are the different types of Conflicts. 08

OR

Discuss Maslow's theory of Self - Actualization. 08

F.Y.Bsc- PHYSICS P-I SEM-II

FS207 Sem-II Reg / KT 29/04/2022

PART-A

N.B. 1.Attempt all questions.
2. Each question carries one mark.
3. Non-programmable scientific calculator is allowed.
4. Mark only one correct answer. If you mark more than one that question will not be assessed.

1. If the A= 3i+3j-5k and B=2i+j+3k then A-B=.....
   a) 5i+6j b) 6i+5j c) 6i+3j -2k d) i+2j-6k
2. Which of the following is a scalar?
   a) mass b) force c) torque d) velocity
3. If B= 4i-2j+4k, magnitude of B=.....
   a) 0 b) 6 c)7 d)-6
4. P and Q are two vectors then their cross product.....
   a) PQcosϕ b) PQsinϕ c) P.Qsinϕ d) PXQcosϕ
5. k x i = ...
   a) –j b) j c) 1 d) 1
6. A + B = B + A.....property of vectors, where A, B are two vectors.
   a) distributive b) associative c) commutative d) equal
7. If A=2i-3j-k, then the magnitude of A=.....
   a) $\sqrt{14}$ b)$\sqrt{13}$ c)$\sqrt{41}$ d)$\sqrt{31}$
8. Three vectors A, B and C are sach that A.B=0, A.C=0 then A is parallel to.....
   a) AXC b) BXC c) AXB d) B
9. If the angle between the two vectors is 180°, then they are.....vectors.
   a) perpendicular b) parallel c) antiparallel d) equal
10. A vector field is irrational if.....
    a) curlV=0 b) div V=0 c) grad V=0 d) curl grad V =0
11. ..... operator turns scalar into vector and vector into scalar.
    a) grad b) curl c) tenser d) del
12. Find the (gradw) at (1,0,1) for a scalar function $Z^2 = X^2 + Y^2$
    a) 0 b) 2 c) 4 d) 6
13. A vector field is independent of time is called.....
    a) invariant b) static c) scalar d) stationary
14. a, b and c are 3 vectors, then their vector triple product is.....
    a) a x (b x c) b) a. (b x c) c) a x (b.c) d) a. (b . c)
15. If r= xi + yj + zk is a position vector. What is ∇.r = ?
    a) 0 b)1 c)2 d)3
16. ∇.(k A) =..... where k= constant.
    a) k (∇.A) b) 0 c) 1 d) ∇.(Ak)
17. A scalar field ϕ = 3yx – 5zy + 5zx at point (1,1,1) is.....
    a) 5 b) 3 c) -3 d)-5
18. A differential equation is considered to be partial differential equation if it has
    a. one dependent variable
    b. more than one dependent variable
    c. one independent variable
    d. more than one independent variable

19. The quantity $\frac{L}{R}$ has the dimension of
    a. s
    b. 1/s
    c. H/s
    d. s/H

20. The equation y"-3y' = 3x is
    a. second order homogeneous differential equation

b. third order homogeneous differential equation
c. second order non-homogeneous differential equation
d. third order non-homogeneous differential equation

21. Which of the following is correct statement of the given differential equation

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 7y = 0$$

a. order-1, degree-2, homogeneous
b. order-2, degree-1, homogeneous
c. order-1, degree-2, non-homogeneous
d. order-2, degree-1, non-homogeneous

22. The unit of capacitance is _____
a. V/A-s
b. V/A-s²
c. A-s/V
d. A-s²/V

23. In CR-series circuit, the time constant is that time in which the charge grows from zero to the value q_0 (where q_0 is the maximum charge) _____
a. $0.63q_0$
b. $0.52q_0$
c. $0.37q_0$
d. $0.23q_0$

24. A differential equation is considered to be ordinary if it has
a. one dependent variable
b. more than one dependent variable
c. one independent variable
d. more than one independent variable

25. The solution of differential equation is $y = C_1 cosx + C_2 sinx$. If it satisfy the condition $y(0) = 1$ & $y\left(\frac{\pi}{2}\right) = 2$ then
a. $C_1 = 2$ & $C_2 = -1$
b. $C_1 = 1$ & $C_2 = -2$
c. $C_1 = 1$ & $C_2 = 2$
d. $C_1 = -1$ & $C_2 = -2$

26. In the given differential equation $\ddot{y} + 2\delta\dot{y} + k^2y = 0$, if $\delta = 0$ then the motion is
a. oscillatory with constant amplitude
b. oscillatory with amplitude decaying exponentially with time
c. critical damping
d. over damping

27 The differential equation $e^{\left(x+\frac{dy}{dx}\right)} = 1$ has solution
a. $y = \frac{x^2}{2} + C$
b. $y = -\frac{x^2}{2} + C$
c. $y = x + C$
d. $y = -x + C$

28. The general solution of the equation $xdy - ydx = 0$ is
a. $y = Ce^x$
b. $y = Ce^{-x}$
c. $y = Cx$
d. $y = -Cx$

29. The differential equation $M(x,y)dx + N(x,y)dy = 0$ is exact if it satisfy
a. $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$
b. $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
c. $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$
d. $\frac{\partial M}{\partial x} \neq \frac{\partial N}{\partial y}$

30. The general solution of the differential equation $\frac{dy}{dx} = ky$ is
a. $y = -Cx$
b. $y = Cx$
c. $y = Ce^{-kx}$
d. $y = Ce^{kx}$

31. Let E = steady emf applied, the potential difference V_R across R at any instant t in LR-series circuit during the growth of the current is

a. $V_R = E(1 - e^{\frac{R}{L}t})$ b. $V_R = E(1 - e^{-\frac{R}{L}t})$

c. $V_R = Ee^{\frac{R}{L}t}$ d. $V_R = Ee^{-\frac{R}{L}t}$

32. The growth of charge q on the capacitor in CR-series circuit at any instant t is ____ (Here q_0 = maximum charge)

a. $q = q_0(1 - e^{\frac{t}{CR}})$ b. $q = q_0(1 - e^{-\frac{t}{CR}})$

c. $q = q_0 e^{\frac{t}{CR}}$ d. $q = q_0 e^{-\frac{t}{CR}}$

33. A coil of self inductance 100H and resistance 10Ω are joined in series with a battery of emf 5 volt. The time constant in the circuit is _____.

a. 5s b. 10s

c. 15s d. 20s

34. In a LR-series circuit has a steady emf E, which is switched on at time $t = 0$. The current in the circuit after a long time will be _____ .

a. zero b. $\frac{E}{R}$

c. $\frac{E}{L}$ d. $\frac{E}{\sqrt{L^2+R^2}}$

35. The time period of simple pendulum of infinite length is _____

a. finite b. Zero

c. infinite d. Independent of length

36. two mutually perpendicular SHMs, $X = A\ sin\omega t$ and $Y = B\ cos\omega t$ acts on the particle simultaneously. The resultant path is _____

a. ellipse b. Circle

c. straight line with slope B/A d. Figure of infinity

37. For a particle executing SHM the phase difference between displacement and velocity is _____

a. π b. Zero

c. $\frac{\pi}{2}$ d. $-\pi/2$

38. A particle is subjected simultaneously to two collinear SHMs having same period, same centre, same amplitude but they are in opposite phase , the resultant motion is ____

a. elliptical b. Circular

c. straight line d. No motion.

39. For superposition of two perpendicular SHMs of same period, $\delta = \beta - \alpha = 0$, the motion is straight line. The slope of the line is __

a. positive b. Negative

c. zero d. Depend upon the initial phase

40. What does the phase constant enables to know about the particle executing SHM at time t = 0?

a. the velocity of the particle

b. distance of the particle from the mean position
c. displacement of the particle from extreme position
d. average velocity of the particle above mean position.

41. The resultant of two mutually perpendicular SHMs acting simultaneously on a particle have amplitude 0.1 m each and phase difference $\frac{\pi}{2}$ is a circle What is the radius of the circle?

a. 0.01 m
b. 0.2 m
c. 0.1 m
d. 0.02 m

42. The factors on which shape of Lissajous figure depends upon are---
1. amplitude of SHM 2. Frequency of SHM and 3. initial phase difference of two SHMs.

a. only option 1 is correct
b. Only 1 and 2 options are correct
c. only 2 and 3 options are correct
d. All are correct

43. A travelling wave propagates according to expression $= 0.04 \sin(200x - 3t)$. What is the frequency of the wave?

a. 0.0477 Hz
b. 477 Hz
c. 0.477 Hz
d. 47.7 Hz

44. Wave transmits _____ from one place to another.

a. mass
b. Amplitude
c. wavelength
d. Energy

45. The higher the frequency of wave _____

a. the lower its speed
b. The shorter the wavelength
c. greater its amplitude
d. Longer its period

46. The sound waves are _____

a. transverse waves
b. Longitudinal waves
c. mixed waves
d. Standing waves

47. The speed of the wave in a stretched string depends upon _____

a. tension in the string
b. Amplitude of wave
c. wavelength
d. Acceleration due to gravity.

48. Assume that spherical waves of average power P emitted by the source. Then the intensity of wave is _____

a. proportional to r
b. Proportional to r^2
c. inversely proportion to r
d. Inversely proportional to r^2

49. A relatively simple method of solving wave equation to find the solution of stationary waves is _____

a. $y(x,t) = \frac{f_1(x)}{f_2(t)}$
b. $y(x,t) = \frac{f_1(t)}{f_2(x)}$
c. $y(x,t) = f_1(x).f_2(t)$
d. $y(x,t) = f\left(\frac{x}{t}\right)$

50. In which of the following the vibrations of the particles of the medium oscillates parallel to the propagation of wave.

a. transverse wave
b. Mixed wave
c. longitudinal wave
d. Electromagnetic wave

PART-B

Q.1A Attempt any **TWO** of the followings:- (12)

i) Define vector product of two vectors. Give two examples. Give any two properties of a vector product. If A=2i+3j-k, find the magnitude of A and the unit vector in the direction of A.

ii) If A= i+3j-k and B=2i-j+k. Find the unit vector parallel to AXB. Find the sine of the angle between A and B.

iii) Show that $\nabla X v=2\omega$ and $\nabla Xv=0$ for a particle moving in a circular path of radius r and angular velocity ω.

iv) Define gradient operator. If $(y^2- z^2+ 3yz-2x)i + (3xz + 2xy)j + (3xy-2xz+2z)k$ is a field. Is it a solenoidal or irrational or both? Justify.

Q.1B Attempt any **TWO** of the followings:- (05)

i) Two vectors P=i+aj-2k and Q=3i-5j+bk are parallel to each-other. Find the unknown a and b.

ii) A constant force F=4i+2j+5k N produces a displacement s=3i+6j+7k m in 3sec. Find the work done and power.

iii) Show that $\nabla f(3,2)=12i+9j$ where $f(x,y)= x^2y$.

iv) Prove that the gradient of sum of two scalar functions is equal to sum of their gradient.

Q.2 A Attempt any **TWO** of the followings:- (12)

i) Obtain the general solution of the second order homogeneous differential equation

$$\frac{d^2y}{dx^2} + p_0\frac{dy}{dx} + q_0y = 0$$

for (a) real and unequal roots
(b) real and equal roots \

ii) Obtain the general solution of the given differential equation

$$\frac{dy}{dx} + P(x)y = 0$$

Hence solve the following differential equation with the indicated condition:

$$L\frac{di}{dt} + iR = 0\ ;\quad i(t=0) = i_0$$

iii) Derive the expression for the decay of charge on a capacitor C connected in series with a resistance R. Show graphically the variation of charge with time. What is meant by time constant of such a circuit.

iv) Determine whether the following equation is exact or not, and find its solution if it exact $\quad x(x^2 + 2y^2)dx + y(2x^2 + y^2)dy = 0$

Q.2 B Attempt any **TWO** of the followings:- (05)

i) Solve the differential equation: $\frac{dy}{dx} + \frac{y}{x+5} = \frac{5}{x+5}$

ii) Solve the differential equation: $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 4y = 0$

iii) In LR-series circuit, $L = 200mH$ and $R = 20\Omega$, is connected to a 100V battery. Calculate the voltage drop across resistance after time $t = 0.05s$

iv) A particle of mass m suspended vertically by a light inextensible string of length l oscillating under gravity constitutes a simple pendulum. Obtain the

differential equation and solve it.

Q.3A Attempt any **TWO** of the followings:- (12)

i) Using the expression $\frac{x^2}{A^2} + \frac{y^2}{B^2} - \frac{2xy}{AB}\cos\delta = sin^2\ \delta$; Obtain Lissajous figures for $\delta = 0, \frac{\pi}{2}, \frac{\pi}{4}$.

ii) Obtain the expression of resultant motion of a particle subjected simultaneously to two mutually perpendicular SHMs of same time period and same centre.

iii) What do you mean by Group velocity of a wave. Obtain the expression for the same.

iv) obtain an expression for the velocity of a transverse wave on a stretched string.

Q.3B Attempt any **TWO** of the followings:- (04)

i) Distinguish between Progressive waves and standing waves.

ii) Show that the general solution of the wave equation $\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2 y}{\partial t^2}$ is $y = f_1(x - ct) + f_2(x + ct)$; where symbols have their usual meanings.

iii) Explain the term Lissajous figures.

iv) Two mutually perpendicular SHMs acting simultaneously on a particle have amplitude of 0.1 m each and phase difference $\frac{\pi}{2}$ rad. If the period of each is 3, find the resultant motion.

********** The End **********

F.Y.Bsc PHYSICS P-II [S-II]

30|04|2022

Sem-II

FS209

PART A

N.B. 1. ATTEMPT ALL QUESTIONS

2. EACH QUESTION CARRY ONE MARK.

3. NON-PROGRAMMABLE SCIENTIFIC CALCULATOR IS ALLOWED.

4. MARK ONLY ONE CORRECT ANSWER. IF YOU MARK MORE THAN ONE THEN THAT QUESTION WILL NOT BE ASSESSED.

1) Complex vector impedance Z is called _____ component. for $Z\sin\theta$

a) Reactive b) quadrature c) resistive d) inactive

2) In a pure resistive ac circuit, power is equal to the _____ of rms values of voltage (emf) and current .

a) Sum b) difference c) product d) ratio

3) Power factor is the _____ of the angle between voltage (emf) and current phasor in pure inductive circuit .

a) Cosine b) Sine c) Tangent d) Cosec

4) The reciprocal of capacitive reactance is called capacitive _____.

a) Reactive b) inactive c) quadrature d) Susceptive

5) Phase difference in series L-R circuit is $\tan^{-1}[\ldots]$

a) $\omega L/R$ b) $R/\omega L$ c) $\frac{1}{\omega CR}$ d) ωCR

6) Series C-R circuit in ac circuit, impedance of the circuit (Z) = $\sqrt{(\ldots)}$.

a) 0 b) X_C^2 c) R^2 d) $R^2+X_C^2$

7) Series LCR circuit is known as _____ circuit.

a) acceptor b) selector c) rejector d) reactor

8) If frequency (f) = 100 Hz and capacitance = 1 μF, then capacitive reactance Xc = _____ .

a) 1092 b) 1392 c) 1592 d) 1892

9) If frequency (f) = 50 Hz and inductance = 0.5 H, then inductive reactance X_L = _____ .

a) 17.13 b) 27.13 c) 37.13 d) 47.13

10) If R = 12 Ω, Xc = 34 Ω and X_L = 50 Ω in series LCR circuit, then the circuit impedance Z = _____ Ω.

a) 10 b) 20 c) 30 d) 40

11) Hay bridge is modified version of _____ bridge.

a) DeSauty b) Maxwell c) Schering d) Wien

12) _____ bridge is suitable for the measurement of inductance coil with Q - factor for greater than 10.
a) DeSauty b) Maxwell c) Schering d) Wien

13) _____ bridge is mainly used to determine frequency in terms of known resistance and capacitance.
a) DeSauty b) Maxwell c) Schering d) Wien

14) In _____ bridge, only capacitors and resistors are connected in opposite arms separately.
a) DeSauty b) Maxwell c) Schering d) Wien

15) In Wien bridge, $R_1 = R_2 = R = 10$ K Ω and $C_1 = C_2 = C = 0 \cdot 1$ μF then frequency (f) = _____ Hz. .
a) 59 b) 159 c) 209 d) 259

16) In Wien bridge, $R_3 = 10$ K Ω then R_4 = _____ K Ω to balance the bridge.
a) 5 b) 10 c) 15 d) 20

17) In Dc'sauty bridge, $R_1 = 1100$ K Ω, $R_2 = 1650$ K Ω and $C_1 = 0 \cdot 33$ μF then C_2 = _____ μF .
a) 0.11 b) 0.22 c) 0.33 d) 0.44

18) The average value of an alternating emf and current over one cycle is _____.
a) Unity b) Half c) Double d) Zero

19) Ripple factor of full wave rectifier (γ) = _____.
a) 41.2 b) 61.2 c) 81.2 d) 91.2

20) Zener diode is as _____.
a) current stabilizer b) voltage stabilizer c) resistance stabilizer d) power stabilizer

21) Efficiency of full wave rectifier (η) = _____.
a) P_{ac}/P_{dc} b) P_{dc}/P_{ac} c) $P_{dc} \cdot P_{ac}$ d) $1/P_{ac} \cdot P_{dc}$

22) Find the value of series resistance (R) connected in series with 6 volt Zener diode produced 140 mA Zener current when connected to 20 volt input supply..
a) 50 b) 80 c) 100 d) 150

23) In Centre-tap full wave rectifier has maximum current (I_m) = 113 mA then dc load current (I_{dc}) = _____mA.
a) 52 b) 62 c) 72 d) 82

24) _____ is a universal gate.
a) OR b) AND c) Ex-OR d) NAND

25) De-Morgan's first theorem $\bar{A}+\bar{B}=$
a) $AB+\hat{A}B$ b) $\bar{A}\cdot\bar{B}$ c) $\overline{A\cdot B}$ d) $A\cdot\bar{B}$

26) Using boolean algebra, solve $AB+\bar{A}B=$ _____.
a) 1 b) 0 c) A d) B

27) _____ NOR gates are required to design NOR as NAND gate.
a) 3 b) 4 c) 5 d) 6

28) _____ gate can be used as parity checker
a) OR b) AND c) Ex-OR d) NOT

29) Logic circuit of half adder is made by using _____ gates.
a) Ex-OR & OR b) Ex-OR & AND c) Ex-OR & NOT d) Ex-OR & NAND

30) An ideal constant current source has _____ internal resistance.
a) zero b) small c) large d) infinite

31) _____ source has zero internal resistance.
a) Ideal Constant Voltage b) Ideal Constant Current
c) Ideal Constant Resistance d) power stabilizer

32) For finding open circuit voltage (V_{TH}) in Thevenin circuit _____ must be removed from circuit.
a) Voltage Source b) Current Source c) Load resistance d) All resistance

33) Calculate R_{TH} if $R_1 = 8\ \Omega$, $R_2 = 4\ \Omega$ $R_3 = 5\ \Omega$, $R_4 = 10\ \Omega$ and resistance combination in circuit like $R_{TH} = (R_1 \mid R_2) + (R_3 \mid R_4) =$ _____ Ω.
a) 4 b) 6 c) 8 d) 10

34) In the maximum power transfer theorem circuit R_{TH} = _____.
a) load resistance (R_L) b) Open circuit voltage (V_{TH}) c) Norton Current (I_N) d) Current across load resistance

35) Under the influence of coulomb field of charge +Q , a charge -q is moving around it in an elliptical path. Which of the following statement is correct?

a. the angular momentum of charge – q is constant

b. the linear momentum of charge – q is constant

c. the angular velocity of charge – q is constant

d. the linear speed of the charge – q is constant.

36) The electric field inside the spherical shell of uniform surface charge density is ___

a. zero b. constant

c. directly proportional to the distance from the centre d. none of these

37) The magnitude of the electric field intensity is such that an electron placed in it would experience an electric force equal to its weight is given by ____

a. mg e b. mg/e c. e/mg d. g

38) Two charged spheres of radii R_1 and R_2 having equal charge density , the ratio of their potential is ___

a. $\frac{R_1}{R_2}$ b. $\frac{R_2}{R_1}$ c. $\left[\frac{R_1}{R_2}\right]^2$ d. $\left[\frac{R_2}{R_1}\right]^2$

39) The electric potential V is given as a function of x m by $V = (5x^2 + 10x - 9)$ volt. Value of electric field at x is ____

a. – 20 V /m b. 6 V / m c. 11 V/m d - 23 V/m

40) The electric potential at any point $V = -5x + 3y - z$, then magnitude of the electric field is ____V/m

a. 6 b. 3 c. – 3 d. 7

41) Static electric field is _____

a. conservative b. solenoidal c. non conservative d. none of these

42) Electrostatic energy is stored in _____

a. medium b. electric field c. charge d. all of these

43) Which of the following is correct form of Lorentz force in magnetic field?

a. $\vec{F}_M = q[\vec{v} \times \vec{B}]$ b) $F_m = q[\vec{v} \cdot \vec{B}]$

c. $\vec{F}_m = q[\vec{B} \times \vec{v}]$ d) $F_m = q\vec{B}$

44) Fleming's right hand rule gives _____ of induced current produced in a straight conductor moving in a magnetic field.

a. motion b. direction c. oscillations d. magnetization

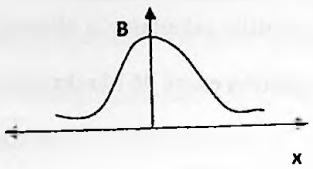
45) For a solenoid of finite length, the magnetic field inside it is uniform, except near the ends which is _____ the mid point value of the magnetic field.

a. double b. same c. half d. four times

(Paper A)

46) Which of the following graph shows the correct relation between magnetic field and the distance of a point along the axis of the coil?

a.



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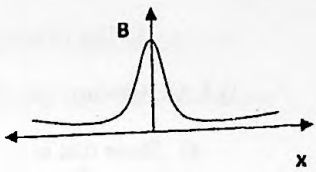

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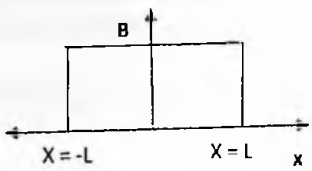

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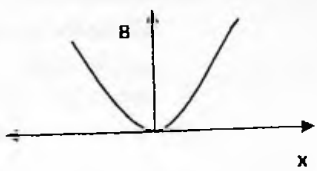


47) What is the SI unit of magnetic flux?

a. volt-second b. amp- second c. Nm/ A d. Nv/A

48) which of the following is not true for the magnetic field lines?

a. magnetic field lines orient from north pole to south pole of the magnet.

b. magnetic field lines are closed and continuous

c. two lines of field can intersect each other

d. none of the above.

49) which of the following is not the source of the magnetic field/

a. electric current b. static charge

c. rotating magnet d. galvanometer carrying current

50) In current carrying conductor in Maxwell's right hand thumb law, the thumb indicates

---

a. direction of magnetic field b. direction of electric current

c. force on the current carrying conductor d. motion of the conductor.

(PART – B)

Note : 1. All questions are compulsory and carry equal marks.

2. Figures to the right indicates full marks

3. Use of non- programmable scientific calculator is allowed.

Q.1.A) Attempt any TWO (following question carry 06 Marks each) **(12M)**

a) Show that in single element Alternating current circuit, the current lags behind e.m. f. by 90° when a pure inductance L in the circuit.

b) An alternating e.m.f. (E) is applied to a resistance R and capacitance C in series. What will be the impedance, the current and the phase difference between the applied e.m.f. and the current?

c) Obtain the conditions required to balance an alternating current bridge.

d) Obtain the conditions required to balance an Maxwell's L/C bridge.

Q.1.B) Attempt any TWO (following question carry 2.5 Marks each) **(05M)**

a) A series LCR circuit consists of an inductance of 100 mH, capacitance 0.1 F and an external resistance of 200 . The supply voltage is 5 volt. Find the resonant frequency.

b) A 100 mH inductance is in series with a 100 Ω resistance and an A.C. voltage source of frequency 1000 Hz. Find the coil resistance X_L and circuit impedance Z.

c) In Maxwell inductance bridge consists of inductance L_1 = 47 mH, and resistances R_2 = R_4 = 100 Ω. Find the value of other inductance L_2.

d) Draw the circuit diagram of Hay's bridge and write down their impedance of each arm.

Q.2.A) Attempt any TWO (following question carry 06 Marks each) **(12M)**

a) State and prove maximum power transfer theorem.

b) Explain with neat diagram the working of bridge full wave rectifier.

c) What is zener diode? Explain, how zener diode can be used as voltage regulator.

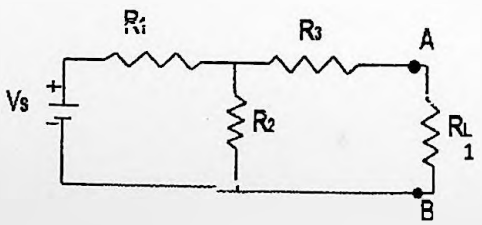
d) State and prove De-Morgan's theorem using basic gates also tabulate its truth table.

Q.2.B) Attempt any TWO (following question carry 2.5 Marks each) **(05M)**

a) What is Ex-OR gate? Design the Ex-OR gate using basic gates.

b) Explain half adder and write its truth table.

c) Find the current through the load of given circuit diagram by using Thevenin's theorem. Given E = 27 V, resistances R_1 = 3Ω, R_2 = 6 Ω, R_3 = 4 Ω and R_L = 12Ω.



Find the value of series resistance

(Part - B)

connected in series with 6V zener diode produces 140 mA zener current when connected to 20 volt input supply.

Q. 3 A) Attempt any Two of the following questions. **(12M)**

a) Obtain an expression for electr4ic force due to continuous charge distribution.

b) What is electric potential/ Obtain the relation between the electric field and electric potential.

c) What is BIOT-SAVART law? Obtain an expression for the magnetic field at point due to current carrying element.

d) Using Biot -Savart law obtain an expression for the magnetic field at any point on the axis of circular coil carrying current I.

Q. 3 B) Attempt any two of the following. **(4M)**

a) A straight long conductor carries a current of 10 A. Calculate the magnetic field at a distance 10 cm from the conductor. (Take: $\mu_0 = 4\pi \times 10^{-7}$ S.I.)

b) What is Lorentz force equation?

c) Find the electric potential at 2 m w.r.t. 10 m due to point charge 25 nC at the origin. Take reference as infinity.

d) What are the limitations of Coulomb's law?

********** THE END **********

FYBSC Chemistry I

FS202 20220425

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OF ARTS, SCIENCE & COMMERCE

F.Y.B.Sc.

SEMESTER – II, PAPER I, APRIL – 2022

Time: 3 hours **Total marks: 100**

N.B.:

1. All questions are compulsory.
2. Answer to the same question must be written together.
3. Figures to the right side indicate full marks
4. Use of non- programmable calculator is allowed

PART A (50 Marks)

Multiple choice question:-

1. "The total pressure exerted by a number of non-reacting gases is equal to the sum of partial pressure of the gases under the same condition" is known as:

a) Boyle's law
b) Dalton's law
c) Avogadro's law
d) Charles's law

2. Correct gas equation is:

a) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$
b) $\frac{V_1T_2}{P_1} = \frac{V_2T_1}{P_2}$
c) $\frac{P_1T_1}{V_1} = \frac{P_2T_2}{V_2}$
d) $\frac{V_1V_2}{T_1T_2} = P_1P_2$

3. Gases deviate from ideal behavior because molecules:

a) are colorless
b) are spherical
c) attract each other
d) have high speed

4. Deviations from ideal behavior will be more if the gas is:

a) low temperature & high pressure
b) high temperature & low pressure
c) low temperature
d) high temperature

5. The units of 'a' in van der Waals' equation $\left(P + \frac{an^2}{V^2}\right)(V - nb) = RT$

a) atm litre^2 mol^{-2}
b) atm litre mol^{-2}
c) atm litre mol^{-1}
d) atm litre^2 mol^{-1}

6. When the universal gas constant (R) is divided by Avogadro's number (N), their ratio is called:

a) Planck's constant
b) Rydberg's constant

c) Boltzmann's constant
d) van der Waals' equation

7. $\frac{a}{V^2}$ given in van der Waals' equation is for:
a) internal pressure
b) intermolecular attraction
c) both (a) and (b)
d) temperature correction

8. The state of equilibrium refers
a) State of rest
b) Dynamic state
c) Stationary state
d) State of inertness

9. For the system 3A + 2B ⇌ C the expression for equilibrium constant is:
a) $\frac{[PCl_2][B]^2}{[C]}$
b) $\frac{[C]}{[A]^2[B]^2}$
c) $\frac{[C]}{[A[B]}$
d) $\frac{[A]^2[B]^2}{[C]}$

10. In the reaction $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$, the amount of PCl_5, PCl_3 and Cl_2 are 2 moles each at equilibrium and the total pressure is 3 atmosphere, the equilibrium constant Kp is
a) 1 atm
b) 2 atm
c) 3 atm
d) 1.5 atm

11. The unit of entropy is
a) $JKmol^{-1}$
b) kJ-1 mol^{-1}
c) kJ mol^{-1}
d) JK^{-1} mol

12. The value of entropy in the universe is:
a) Constant
b) Decreasing
c) Increasing
d) Zero

13. The free energy change ΔG = 0, when
a) reactants are completely consumed
b) a catalyst is added
c) the system is at equilibrium
d) the reactants are initially mixed

14. Le Chatelier's principle is not applicable to
a) $Fe_{(s)} + S_{(s)} \rightleftharpoons FeS_{(s)}$
b) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$
c) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
d) $N2_{(g)} + O2_{(g)} \rightleftharpoons 2NO_{(g)}$

15. Considering entropy (S) as a thermodynamic parameter, the criteria for spontaneity of any process is:
a) ΔSsystem + ΔSsurrounding > 0
b) ΔSsystem > 0 only
c) ΔSsystem - ΔSsurrounding > 0
d) ΔSsurrounding > 0 only

16. PVC stands for _____
a) PolyVinyl Chloride
b) Polyvinyl Carbon
c) Polyvanadium calcium
d) Phosphorus vinyl chloride.

17. The terminal alkyne show _____ character.

a) Weak basic
b) Weak acidic
c) Strong acidic
d) Strong basic

18. Alkynes mainly gives _____ reaction.

a) Halogenation
b) Elimination
c) Substitution
d) Addition

19. The Hydroxylation of alkene by $KMnO_4$ is a _____ reaction.

a) Stereospecific
b) Stereotypes
c) Sterospecial
d) Stereoisomer

20. Which of the following is an example of homogenous catalysis.

a) Nickel
b) Palladium
c) Wilkinson
d) THF

21. Hydroboration oxidation is an important method to prepare long chain primary _____.

a) Phenols
b) Alcohols
c) Aldehydes
d) Ketones

22. Hoffmann elimination is a _____ order reaction.

a) Third
b) First
c) Zero
d) Second

23. In Multi step reaction, the _____ step determines the overall rate of reaction.

a) Fastest
b) Slowest
c) Moderate
d) All of these

24. The C-X & C-H bonds may break simultaneously, this gives rise to _____.

a) E2 mechanism
b) E1 mechanism
c) E1cB mechanism
d) E2cB mechanism

25. In E1cB mechanism, cB stands for _____.

a) Conjugate base
b) Conjugate bond
c) Carbon bond
d) Conjunction base

26. In the case of an unsymmetrical alkyl halide the reaction takes place according to _____ rule.

a) Wurtz
b) Kharash
c) Mayo
d) Saytsev

27. Wilkinson's catalyst is an example of _____ catalysis.

a) Chlorotris(triphenylphosphine) rhodium (I)
b) Chlorotris(triphenylphosphine) rhodium

c) Chloro(triphenylphosphine) rhodium.

d) Chloro(triphenylphosphine) rhodium (II).

28. Diels alder reaction is an example of reaction _____.

a) Cyclo addition
b) Cyclo substitution
c) Cyclo elimination
d) Cyclo combination

29. The epoxide is also called as _____.

a) Oxime
b) Oxirane
c) Peroxy
d) Oxygen

30. Which reagent use in the Anti-Markownikoffs reaction.

a) Peroxide
b) Platinum
c) Sodium hydroxide
d) Sulphuric acid

31. Lesser the reactivity of the reagent, greater is it's _____.

a) Catalytic
b) Productivity
c) Selectivity
d) Quality

32. Coupling of alkyl halide with sodium metal is known as ____ reaction.

a) Wurtz
b) Kharash – mayo
c) Fittig
d) Lewis

33. To maintain constant pH a_____mixture is used

a) Nitrating
b) Buffer
c) Aquaregia
d) Halogen

34. ____Reaction involves alkylation of the aromatic ring.

a) Wurtz-fittig
b) Wurtz
c) Fittig
d) Arrhenius

35. Halogenation of alkanes takes place by____ mechanism.

a) Free radical
b) Chain reaction
c) E1
d) E2

36. Alkanes undergo _____ reaction.

a) Elimination
b) Substitution
c) Displacement
d) Double displacement.

37. Alcohols when heated in presence of sulphuric acid undergo _____ to form an alkene.

a) Elimination
b) Decomposition
c) Combination
d) Substitution

38. Weak base has _____conjugate acid and weak acid has _____conjugate base

a) Strong, Strong
b) Weak, Weak
c) Strong, Weak
d) Weak, Strong

39. In alkylation _____ increases the electrophilicity of the alkyl halide.

a) BF3
b) AlCl3
c) K2S2O8
d) K2Cr2O7

40. Alkyl halide reacts with the lewis acid and forms electrophilic _____.

a) Cation
b) Carbocation
c) Anion
d) Carboanion

41. Friedal craft acylation is important method of preparing_____

a) Aldehyde
b) Alcohol
c) Ketones
d) Benzene

42. Class-b metals includes ions of _____transition metals

a) Smaller
b) Lighter
c) Bigger
d) Heavier

43. Class-a metals includes ions of _____metals.

a) Alkali & Alkaline earth
b) Transition
c) Inner transition
d) None of the above

44. Class-a Metals are____

a) Hard bases
b) Hard acids
c) Soft acids
d) Soft bases

45. The confirmatory test for chlorine is_____test

a) Chromyl Chloride
b) Starch Iodide
c) Litmus paper
d) KMNO4

46. The colour of bromine gas is_____

a) Reddish Brown
b) Violet
c) Greenish Yellow
d) Scarlet

47. The colour of iodine gas is_____

a) Bluish green
b) Greenish yellow
c) Reddish brown
d) Violet

48. The formula for Potassium Dichromate is_____

a) $K_2Cr_2O_7$
b) K_2CrO_4
c) KCr_2O_5
d) $K_3Cr_3O_9$

49. Dimethyl Glyoxime paper is used to test _____

a) Ferric Ion
b) Magnesium Ion
c) Ferrous Ion
d) Nickel Ion

50. Ammonium Chloride and Ammonium Hydroxide have _____ion
a) Weak
b) Strong
c) Common
d) Positive

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F.Y.B.Sc.

SEMESTER – II, PAPER I, APRIL – 2022

Time: 3 hours **Total marks: 100**

N.B.:

1. All questions are compulsory.
2. Answer to the same question must be written together.
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PART B (50 Marks)

Q1. Attempt any 2 out of 4 **10M**

1. Define the terms Ideal gas and Real gas. How they differ from each other?
2. Under van der waals' equation, calculate the temperature at which 6 moles of ammonia have volume of 20 dm^3 at a pressure of 2.027 x 10^6 Nm^{-2} (R = 8.314 $JK^{-1}mol^{-1}$, a = 0.422 Nm^4/mol^2, b = 3.71 x 10^{-5} m^3/mol)
3. Explain the following terms:
   a) Reversible Reaction b) Irreversible Reaction c) Equilibrium State
   d) Homogeneous Reaction e) Heterogeneous Reaction
4. 1 mole of PCl_5 is heated in 2.0 dm^3 vessel at 250°C at equilibrium, the vessel was found to contain 0.350 moles of PCl_5 and Cl_2 each. Calculate equilibrium constant.

Q2. Attempt any 2 out of 4 **10M**

1. Explain the terms qualitative & quantitative analysis.
2. What are dry test & wet test? Explain with examples.
3. Name the various types of qualitative analysis.
4. Write a note on HSAB concept

Q3. Attempt any 2 out of 4 **10M**

1. What is Wurtz reaction & Wurtz fittig reaction? Explain with examples.
2. What is β-Elimination? Explain E1 mechanism with energy profile diagram?
3. What is Anti-Markownikoffs rule? Explain its free radical mechanism in details.
4. Explain oxymercuration – demercuration reaction with examples.

Q4. Attempt any 2 out of 4 **10M**

1. Describe in detail Joule-Thomson effect.
2. State and discuss Le Chatelier's Principle.

3. What are the observations to indicate that the gases evolved are:
(i) CO_2
(ii) SO_2
(iii) Cl_2
4. Explain Hydroboration Oxidation reaction with Mechanism?

Q5. Attempt any 2 out of 4 **10M**

1. Enlist the factors affecting chemical equilibrium. Explain them.
2. How will you prepare the following reagents paper (any 3):
(i) Starch Iodide paper
(ii) Potassium Dichromate paper
(iii) Oxine paper
(iv) Lead Acetate paper
3. Give the reaction of ozonolysis of alkenes & also give it's mechanism.
4. Write a note on 'Common Ion Effect'.

F/BSC Chemistry - II

FS203

26/04/2022

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OF ARTS, SCIENCE & COMMERCE

F.Y.B.Sc.

APRIL – 2022 (PAPER II) (SEMESTER – II)

Time : 3 hours | Total marks : 100

N.B. :

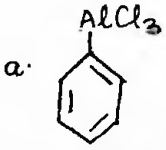
1. All questions are compulsory.
2. Answer to the same question must be written together.
3. Figures to the right side indicate full marks
4. Use of non- programmable calculator is allowed

PART A

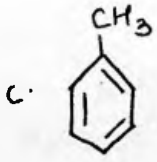
Multiple choice questions :- 50 marks

1. Covalent bond forms when two electrons in a molecule is _____.
   a. Shared equally by both the atoms
   b. Not shared equally by both the atoms
   c. Are transferred from one atom to other atom
   d. Both a and b

2. 

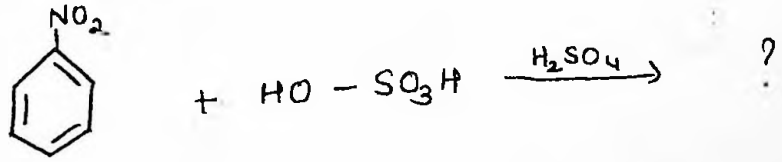
   a. 

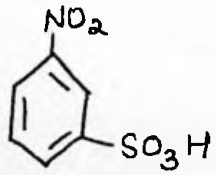
   b. 

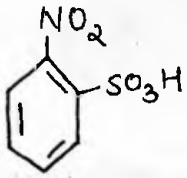
   c. 

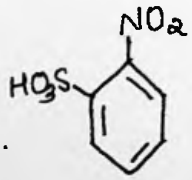
   d. 

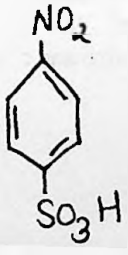
3. All weak electrolytes dissociates _____.
   a. 100%
   b. Completely
   c. 50%
   d. Both b and c

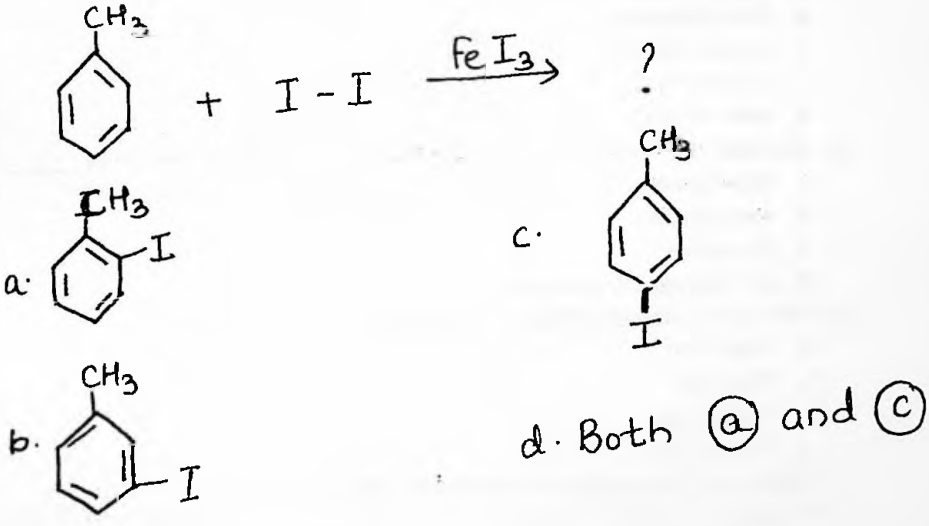
4. Aromatic hydrocarbons obey _____ rule.
   a. Boyle's
   b. Huckle
   c. Charle's
   d. Angular fusion
5. Ionic bond forms when two electrons in a molecule is _____.
   a. Shared equally by both the atoms
   b. Not shared equally by both the atoms
   c. Are transferred from one atom to other atom
   d. Both a and b
6. A molecule performs vibrational motion by absorbing _____.
   a. UV radiation
   b. Visible radiation
   c. NIR radiation
   d. FIR radiation
7. Nitration is _____.
   a. Introduction of halogen group into an aromatic compound
   b. Introduction of nitro group into an aromatic compound
   c. Introduction of sulpho group into an aromatic compound
   d. Introduction of acyl group into an aromatic compound
8. If the central atom is attached to 5 atoms, then the arrangement of electron pairs around the central atom is _____.
   a. Trigonal planar
   b. Pentagonal
   c. Trigonal bi-pyramidal
   d. Linear
9. Turbidimetry involves the measurement of light _____ by a scattering species.
   a. Transmission
   b. Absorption
   c. Both a and b
   d. None of these
10. 

a. 

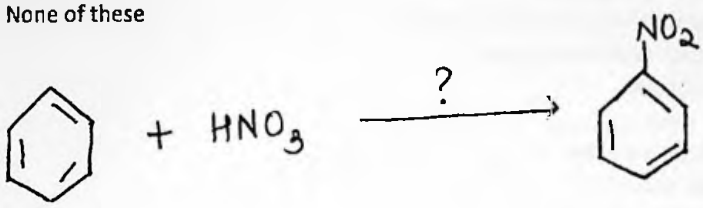
b. 

c. 

d. 

11. The repulsive interaction of lone pairs in decreasing order is given as _____.
    a. L.P. –L.P. > L.P – B.P. > B.P. –B.P.
    b. L.P. –B.P. > L.P – L.P. > B.P. –B.P.
    c. L.P. –L.P. > L.P – B.P. > B.P. –B.P.
    d. B.P. –B.P. > L.P – B.P. > L.P. –L.P.
12. Amorphous solids do not have _____.
    a. Sharp melting point
    b. Characteristic geometrical shape
    c. Regularity of the structure
    d. All of these
13. Halogens are _____ groups.
    a. Ortho – para directing and deactivating groups.
    b. Meta directing groups
    c. Activating groups
    d. None of these
14. In a oxidation process, the oxidation number of the element _____.
    a. Increases
    b. Decreases
    c. Does not change
    d. None of the these
15. Amorphous solids are _____.
    a. Anisotropic
    b. Isotropic
    c. Non isotropic
    d. None of these
16. 

17. Which of the following is definition of oxidation according to electron method?
    a. Gain of electrons
    b. Loss of electrons
    c. Addition of H_2
    d. Removal of O_2

18. Which of the following is not a criteria for aromaticity?
    a. Obey Huckle rule
    b. Have delocalised pi-bonds
    c. Linear structure
    d. Ring structure
19. Two fold axes of symmetry is also called as _____.
    a. Diad
    b. Triad
    c. Tetrad
    d. None of these
20. 

    a. H_2SO_4

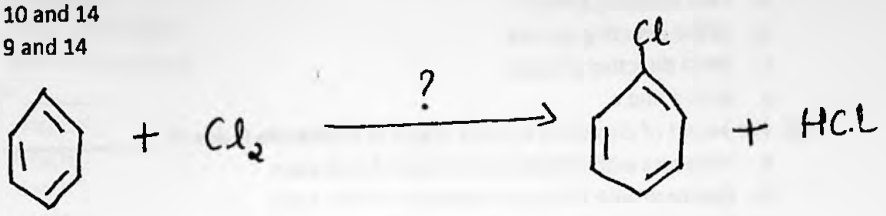
    b. HNO_3

    c. $FeCl_3$

    d. $AlCl_3$

21. According to electron method, reduction is _____.
    a. Gain of electrons
    b. Loss of electrons
    c. Addition of H_2
    d. Removal of O_2
22. The number of wave which cross a given point in one second is known as _____.
    a. Wavenumber
    b. Wavelength
    c. Frequency
    d. Electromagnetic spectrum
23. Which is the most stable form of cyclohexane?
    a. Chair form
    b. Boat form
    c. Twisted boat
    d. Twisted chair
24. Which of the following is not a crystalline solid?
    a. KCl
    b. CsCl
    c. Glass
    d. Rhombic sulphur

25. The normal pH range of water is between _____.
    a. 4 and 9
    b. 1 and 4
    c. 10 and 14
    d. 9 and 14

26. 

    a. $FeCl_3$
    b. $MgCl_2$
    c. $ZnCr_3$
    d. PF_3Cl_2

27. In the reaction, $2Fe + Cl_2 \longrightarrow 2FeCl_3$
    a. Fe is reduced
    b. Fe is oxidised
    c. Cl_2 is oxidised
    d. None of the above

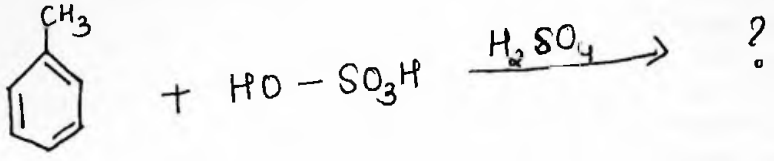
28. The oxidation number of $K_2Cr_2O_7$ is _____.
    a. 14
    b. 6
    c. 12
    d. 10

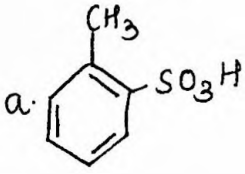
29. Choose the activating group from the following?
    a. NO_2
    b. NH_2
    c. Both a and b
    d. None of these

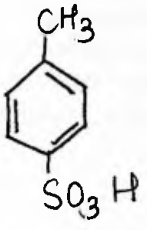
30. An oxidizing agent is a substance which brings about _____.
    a. Oxidation
    b. Hydrolysis
    c. Reduction
    d. Electron donation

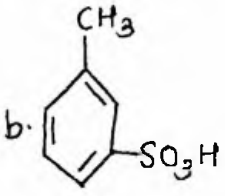
31. Indicator used in the titrations involving the use of iodine solution is _____.
    a. Starch
    b. Phenolphthalien
    c. Methyl orange
    d. Erichrome black T

32. Introduction of halogen group into an aromatic compound is called _____.
    a. Nitration
    b. Sulphonation
    c. Halogenation
    d. Friedel Craft Acylation

33. Substituent which directs the second incoming substituent to meta position are known as _____.
    a. Para directing groups
    b. Ortho directing groups
    c. Meta directing groups
    d. Both a and c
34. The extent of distortion in bond angles in a molecule is due to _____.
    a. Increases with increase in number of lone pairs
    b. Decrease with increase in number of lone pairs
    c. Increase with increase in bond pair
    d. Decrease with increase in bond pair
35. 

a. 

c. 

b. 

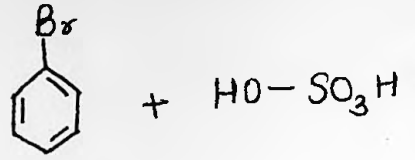
d. None of these

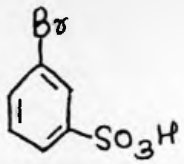
36. Electropositive and electropositive element together form _____.
    a. Metallic bond
    b. Covalent bond
    c. Ionic bond
    d. None of the above
37. According to VSEPR theory, shape of $BeCl_2$ is _____.
    a. Linear
    b. Trigonal planar
    c. Pentagonal
    d. Trigonal bi-pyramidal
38. Bond angle of cyclo-propane is _____.
    a. 120°
    b. 80°
    c. 109°
    d. 60°

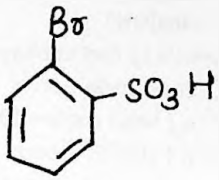
39. As temperature increases, the degree of dissociation also _____.
    a. Increases
    b. Decreases
    c. Does not change
    d. None of the above
40. pH = _____
    a. $-\log[OH^-]$
    b. $+\log[H^+]$
    c. $-\log[H^+]$
    d. $+\log[OH^-]$
41. Formula to find out Bayer's strain is _____.
    a. Bond angle – 60°
    b. ½ [bond angle – 109°28′]
    c. ½ [109°28′ – bond angle]
    d. None of the above
42. The absorption of electromagnetic radiation at one energy and its re-emission of lower energy is called _____.
    a. Absorption
    b. Transmission
    c. Scattering
    d. Fluorescence
43. Which of the following is activating group?
    a. $-NO_2$
    b. –OH
    c. $-SO_3H$
    d. –CN
44. Degree of dissociation of strong electrolyte is _____.
    a. Equal to 1
    b. > 1
    c. < 1
    d. None of the above
45. pH + pOH = _____ of pure water at 25°C
    a. 14
    b. 15
    c. 8
    d. 7
46. Angle strain is also known as _____.
    a. Bayer's strain
    b. Transannular strain
    c. Eclipsing strain
    d. None of these
47. Solution of strong electrolyte contains _____ ions
    a. Positive ion
    b. Negative ion
    c. Positive and negative ion
    d. Neutral ion

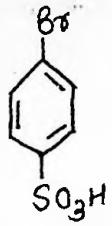
48. The centre of symmetry possesses by any crystal is always equal to ____.

a. 1
b. 5
c. 8
d. 2

49. 

a. 

b. 

c. 

d. Both b and c.

50. Name the compound.

a. Furan
b. Thiopene
c. Pyrrole
d. Benzene

Rizvi Education Society's

RIZVI COLLEGE

OF ARTS, SCIENCE & COMMERCE

F.Y.B.Sc.

APRIL – 2022 (PAPER II) (SEMESTER – II)

PART B

N.B. :

1. All questions are compulsory.
2. Answer to the same question must be written together.
3. Figures to the right side indicate full marks
4. Use of non- programmable calculator is allowed

Q1. Attempt any 2 out of 4 20M

A) Difference between amorphous and crystalline solids. 5M

B) Determine the miller indices of the following crystal planes which intercepts on X, Y, Z 5M

i. 2a, 3b, 3c
ii. a/2, 3b, c

C) Describe the Henderson's equation for basic buffer. 5M

D) Calculate the frequency, wavenumber and energy associated with the quantum of visible light of wavelength is 525nm 5M

($c = 3x10^8 m/s$, $h = 60625x10^{-34} Js$)

Q2. Attempt any 2 out of 4 20M

A) Difference between covalent bond and ionic bond. 5M

B) Draw Lewis Dot Structure of BCl_3 molecule and also calculate the formal charge. 5M

C) Calculate oxidation number of sulphur in the given following compounds. 5M

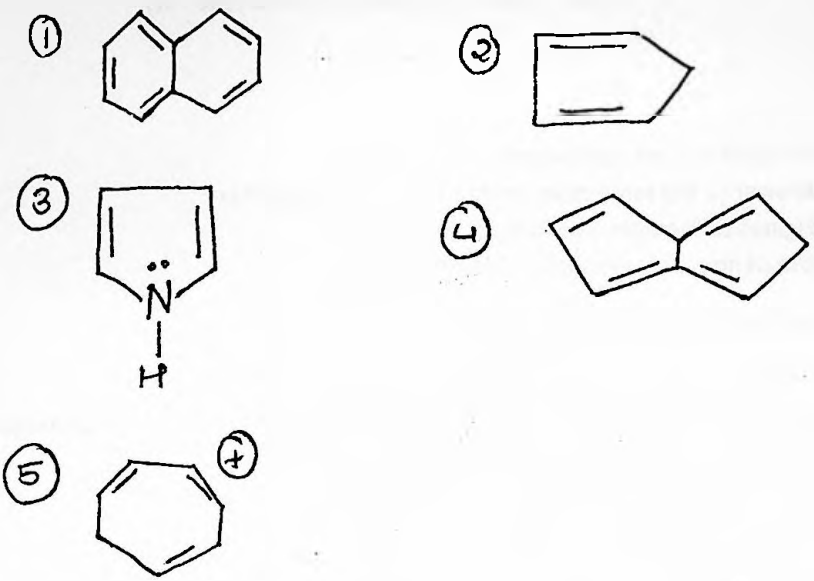
(ANY 3)

i. SO_2
ii. H_2SO_4
iii. $H_2S_2O_7$
iv. SO_3
v. H_2SO_3

D) Define oxidation, reduction and redox reaction on the basis of electronic concept 5M

Q3. Attempt any 2 out of 4 20M

A) Find which of the following is aromatic:- 5M



B) Explain angle strain with an example 5M

C) Explain Friedel Craft Acylation and Friedel Craft Alkylation. 5M

D) Define aromaticity with an example and give the criteria for aromaticity 5M

Q4. Attempt any 2 out of 4. 20M

A) Explain how wavenumber, wavelength, frequency inter-related 5M

B) State and explain law symmetry. 5M

C) Write the characteristics of covalent bond. 5M

D) Find the angle strain of the following:- 5M

i) Propane

ii) Pentane

Q5. Attempt any 2 out of 4. 20M

A) If H^+ ions of a solution is 10^{-4}mol/dm^3. What is pOH? 5M

B) Explain the shape and the bond angle of the following molecules on the basis of VSEPR theory:- 5M

i) PF_3Cl_2

ii) $BeCl_2$

C) Balance the following equation by oxidation number method. 5M

$$S + HNO_3 \longrightarrow SO_2 + NO_2 + H_2O$$

D) Complete the following:- 5M

(1) 

$$+ \quad HO - NO_2 \xrightarrow{H_2SO_4} \ ?$$

(2) 

$$+ \quad HO - SO_3H \xrightarrow{H_2SO_4} \ ?$$

(3) 

$$+ \quad Cl - Cl \xrightarrow{FeCl_3} \ ?$$

(4) 

$$+ \quad HO - NO_2 \xrightarrow{H_2SO_4} \ ?$$

(5) 

$$+ \quad HO - SO_3H \xrightarrow{H_2SO_4} \ ?$$

FYBSc Sem-II Reg
FS208 Zoology-I 29/04/2022

Rizvi College of Arts, Science & Commerce

FYBSc Semester II

Zoology Paper I (Course III)

Part A **Total 50 Marks**

N.B:
1. All questions are compulsory
2. All questions carry equal marks
3. Mark only one option out of four given choices

1. _____is the density per unit of actual habitat space.
   a. Population size b. Crude density c. Specific density d. Population ecology
2. _____is the loss of organisms from a population per unit time.
   a. Mortality b. Natality c. Fecundity d. Population size
3. Diagonal survivorship curve is observed in_____
   a. Man b. Mice c. Butterfly d. Lizard
4. A group of individuals born during the same time interval is termed as a _____
   a. Cohort b. Aggregate c. Species d. Sub species
5. _____is the ratio of natality and mortality.
   a. Fecundity b. Vital index c. Population size d. Population density
6. _____pyramid indicates the high percentage of young individuals.
   a. Triangular shape b. Bell shape c. Urn shape d. J shaped
7. Common octopus is the example of_____
   a. Semelparous b. Iteoparous c. Viviparous d. Homosapien
8. _____ is one way inward movement of individuals into the population.
   a. Migration b. Emigration c. Immigration d. Predation
9. The individuals of the population are arranged in clusters in_____
   a. Random distribution b. Clumped distribution
   c. Uniform distribution d. Species distribution
10. The species reproduce in the absence of competitors and predators in_____
    a. Fundamental niche b. Realized niche c. Trophic niche d. Ecological niche
11. Interaction between the members of same species is_____
    a. Intraspecific b. Interspecific c. Monospecific d. Polyspecific
12. In _____both of the interacting partners are benefitted.
    a. Predation b. Mutualism c. Parasitism d. Neutralism
13. Egrets and non- parasitic insects are the example of _____
    a. Mutualism b. Competition c. Commensalism d. Predation
14. _____helps in compilation of various numerical data.
    a. Census b. Population size c. Ecological niche d. Population density
15. _____is the ratio of females to males in a population.
    a. Fertility b. Sex ratio c. Fecundity d. Population size
16. An example of primary consumer is
    a. Tiger b. Deer c. Lion d. Wolves
17. One of the important abiotic component of ecosystem is
    a. Plants b. Animals c. Micro organisms d. Water
18. With respect to temperature, the rate of development of eggs and larvae is more rapid in
    a. Fresh waters b. Polluted waters c. Warm waters d. Cold waters

19. In hydrologic type of biogeochemical cycle, the reservoir pool is
a. Water b. Oxygen c. Sediment d. Soil

20. The nitrogen fixing bacteria is
a. Nostoc b. Anabaena c. Rhizobium d. Actinomycetes

21. Stream is a
a. Lentic habitat b. Lotic habitat
c. Terrestrial ecosystem d. Dessert biome

22. In lentic habitat, the bottom layer which is colder and non-circulating is called
a. Epilimnion b. Thermocline c. Hypolimnion d. Metalimnion

23. Detrivores are
a. Grass and rodents b. Bacteria and fungi
c. Deer and tiger d. Eagle and snake

24. The interactions of animals in an ecosystem is explained to a greater extent by
a. Food webs b. Food chain c. Pyramids d. Energy flow

25. Unique concept of ecological pyramid was put forth by
a. Raymond Pearl b. Thomus Malthus
c. Charles Elton d. Charles Darwin

26. The type of pyramid of biomass in aquatic ecosystem
a. Partly Upright b. Partly inverted c. Upright d. Inverted

27. The shorter food chain has more amount of energy available even at the highest trophic level in
a. Pyramid of number b. Pyramid of energy
c. Pyramid of biomass d. Pyramid of mass

28. Negative interaction could be catcgorized as
a. Predation b. Mutualism c. Commensalism d. Intraspecific

29. An ideal example of commensalism is
a. Termite and trichonympha b. Remora on shark
c. Penicillin d. Head louse

30. Ticks and mites are
a. Endoparasite b. Intracellular parasites
c. Ecotoparasite d.Pathogenic parasites

31. Species that are at high risk of endangerment in the wild are
a. Extinct b. Extinct in the wild c. Endangered d. Vulnerable

32. National animal of Russia is
a. Wild bear b. Giant panda c. Bold eagle d. Kiwi

33. Gharial is categorized as
a. Critically endangered b. Endangered c. Extinct d. Vulnerable

34. The National Park originally known as "Krishnagiri National Park"
a. Jim Corbett National Park b. Kaziranga National Park
c. Sanjay Gandhi National Park d. Tadoba National Park

35. *Panthera pardus* is the representative animal species of
a. Pirotan Island Marine Park b. Keoladeo Ghana National Park
c. Sanjay Gandhi National Park d. Silent Valley National Park

36. The park situated near Chandrapur in the North Eastern Maharashtra
a. Tadoba National Park b. Gir National Park
c. Jim Corbett National Park d. Bandipur Wildlife Sanctuary

37. *Heteroglaux blewitti* is
    a. Indian Pangolin
    b. Forest owlet
    c. Asiatic lion
    d. Long – billed vulture
38. The key identification feature of the one – horned rhino is
    a. Thick skin & hairless
    b. Two horns
    c. Skin with heavy folds
    d. A single black horn
39. Sasan – Gir is located in
    a. Gujarat b. Maharashtra c. Delhi d. Orissa
40. The representative animal species of Gir National Park is
    a. Asiatic lion
    b. Long – tail macaque
    c. One – horned rhino
    d. Indian pangolin
41. Dugong is
    a. Marine bird b. Marine fish c. Marine mammal d. Marine reptile
42. The Siberian crane is the _____ critically endangered crane species in the world
    a. First b. Second c. Third d. Fourth
43. The representative animal species of Bandipur National Park is
    a. Black buck b. Asian Elephant c. Siberian crane d. Coral reefs
44. The Project Tiger was launched in the year
    a. 2000 b. 1980 c. 1973 d. 1993
45. Despite continued threats of poaching the rhino population is increasing due to
    a. IRV 2020 b. Project Tiger c. WWF d. NTCA
46. Eco tourism is also known as
    a. Geography based tourism
    b. Historical tourism
    c. Nature based tourism
    d. Environment based tourism
47. Maharashtra valley of flowers is
    a. Coconut lagoon
    b. Mountain trail
    c. Tree of life resort
    d. Kaas plateau
48. Unauthorized use of biological resources and traditional knowledge
    a. Biopiracy b. CITES c. Nagoya protocol d. WIPO
49. World Intellectual Property Organization is
    a. WIPO b. WWI c. WIPS d. IPOW
50. Govind Wild Life Sanctuary is located in
    a. Konkan b. Uttarkashi c. Pune d. Jaipur

Rizvi College of Arts, Science & Commerce

FYBSc Semester II

Zoology Paper I (Course III)

Part B **Total 50 Marks**

N.B: 1. All questions are compulsory
2. All sub questions carry equal marks
3. Draw neat labelled diagram wherever necessary

Q1. Describe the following (Any two) **10 Marks**

A. Population density
B. Significance of Mortality
C. Fecundity
D. Triangular shaped pyramid

Q 2. Describe the following (Any two) **10 Marks**

A. Impact of temperature on colouration and morphology of animals
B. Oxygen cycle
C. Parasitic food chain
D. Mutualism

Q3. Describe the following (Any two) **10 Marks**

A. Sanjay Gandhi National Park
B. Project Rhinoceros
C. Ecotourism in Konkan
D. Basmati Rice Patent

Q4. Write a brief note on (Any two) **10 Marks**

A. J-Shaped growth curve
B. Lotic habitat
C. Extinct (EX) category
D. Migration

Q5. Write short notes on (Any two) **10 Marks**

A. Mark- recapture method
B. Pyramid of biomass
C. Asian elephant
D. Abiotic component of ecosystem

FS210 30/04/22

Rizvi College of Arts, Science & Commerce

FYBSc Semester II

Zoology Paper II (Course IV)

Part A **Total 50 Marks**

N.B: 1. All questions are compulsory
2. All questions carry equal marks
3. Mark only one option out of four given choices

1. Father of Nutrition is
   a. Antoine Lavoisier b. Griffith c. Darwin d. Jordan
2. This Nutrient Provide functional and Structural materials
   a. Carbohydrate b. Protein c. Fat d. Minerals
3. Top of food pyramid comprise of
   a. Oils & Sweets b. Milk c. Fruits d. Cereals & Rice
4. The calories intake recommended by ICMR for infants of 0-6 months is
   a. 100 cal/kg body weight b. 120 cal/kg body weight
   c. 150 cal/kg body weight d. 200 cal/kg body weight
5. There is no specific treatment of this type of anaemia
   a. Iron deficiency anaemia b. Anaemia due to chronic diseases
   c. Aplastic anaemia d. Haemolytic anaemia
6. Rickets is caused due to deficiency of Vitamin
   a. Vitamin A b. Vitamin B c. Vitamin C d. Vitamin D
7. It mean severe loss of body weight in children
   a. Goitre b. Marasmus c. Anaemia d. Piles
8. Goitre is caused due to deficiency of
   a. Protein b. Zinc c. Iodine d. Calcium
9. Hard faeces not passing motion in 3-4 days
   a. Piles b. Constipation c. Acidity d. Peptic ulcer
10. Over- the – counter medications used in soothing
    a. Peptic ulcers b. Piles c. Starvation d. Acid reflux
11. It is the state of having excessive stomach or intestinal gas due to digestibility disorder
    a. Acidity b. Flatulence c. Obesity d. Piles
12. It is a severe deficiency in caloric intake
    a. Kwashiorkar b. Beri-beri c. Starvation d. Rickets
13. Amount of storage fat in adult male
    a. 15-20% b. 20-25% c. 25-30% d. 30-35%
14. BMI rate for Normal weight is
    a. Less than 18.5 b. 18.5-24.9 c. 25-29.9 d. 30-34.9
15. Most of peptic ulcers are caused by an infection with bacteria called
    a. *Ecoli* b. *Lactobacillus* c. *Helicobacter pylori* d. *Enterobacter sp.*
16. It is an interaction with other people and interpersonal relations
    a. Physical health b. Psychological health
    c. Social health d. Mental health
17. World health day is observed on
    a. 7th January b. 7th February c. 7th March d. 7th April

18. It is caused by a RNA virus affecting primarily alimentary canal
a. Polio b. Smallpox c. Variola d. Malaria
19. WHO launched a global campaign to eliminate small pox in year
a. 1940 b. 1950 c. 1955 d. 1966
20. This phase of Malaria eradication program is also called as surveillance
a. Preparatory b. Attack c. Consolidation d. Maintenance
21. Leprosy in 1955 was controlled by using
a. Dapsonemonotherapy b. MDT c. Chemotherapy d. Radiation
22. Total amount of water in our body
a. 50% b. 70% c. 90% d. 92%
23. Ice occupies ____ of earth's water
a. 0.01% b. 1% c. 2% d. 2.5%
24. Water expands at
a. 0^0C b. 4^0C c. 10^0C d. 100^0C
25. It is the amount of consumptive use of rain water required to make a product
a. Green water footprint b. Bluewater footprint
c. Grey water footprint d. Black water footprint
26. It is a parasitic STI
a. Chlamydia b. Gonorrhea c. Syphilis d. Trichomoniasis
27. Safe radiation limit is
a. 10 milliwatts/sq.m. b. 100milliwatts/sq.m.
c. 0.9 milliwatts/sq.m. d. 0.5 milliwatts/sq.m.
28. Specific Absorption Rate (SAR) is measured in
a. milliwatts/sq.m. b. Kcal/Kg c. W/Kg d. Ampere
29. Amount of blood in average sized adult is
a. 2 litre b. 3 litre c. 5 litre d. 6 litre
30. Prolonged storage of whole blood can be achieved by freezing it at
a. Less than 20^0C b. Less than 10^0C
c. Less than 0^0C d. Less than -70^0C
31. Blood pressure is diagnosed by_____
a. Sphygmomanometer b. ECG c. EEG d. ELISA
32. _____hormones regulates blood glucose level.
a. Thyroid stimulating hormone b. Adrenaline c. Insulin d. Androgen
33. _____is an intense fear of a specific situation.
a. Specific disorder b. Social anxiety disorder
c. Panic disorder d. Generalised anxiety disorder
34. A sleep disorder that are not directly associated with any other health condition is
a. Primary insomnia b. Secondary insomnia c. Anxiety d. Blood pressure
35. Emotional stress is one of the most common triggers of_____
a. Blood pressure b. Migraine c. Depression d. Diabetes
36. False belief is_____
a. Hallucination b. Paranoia c. Delusions d. Cataract
37. Electroconvulsive therapy is for_____
a. Anxiety b. Depression c. Migraine d. Blood pressure

38. Alzheimer's disease is the example of_____
a. Contagious disease b. Congenital disease
c. Communicable disease d. Non communicable disease

39. Tuberculosis is caused by_____
a. HIV b. Salmonella typhi c. Mycobacterium tuberculosis d. HAV

40. Neisseria gonorrhoea is a _____infection.
a. Bacterial b. Viral c. Protozoan d. Helminth

41. Widal test is used to diagnose_____disease.
a. Tuberculosis b. AIDS c. Typhoid d. Hepatitis

42. Influenza virus are the causative agent of
a. Dengue b. Swine flu c. Malaria d. Tuberculosis

43. Breakbone disease is_____
a. Typhoid b. tuberculosis c. AIDS d. Dengue

44. Asthma disease affects_____
a. Kidney b. Liver c. Heart d. Lungs

45. _____is a highly contagious disease spread by sexual activity.
a. Tuberculosis b. Asthma c. Syphilis d. Cancer

46. Bronchial thermoplasty is a treatment for severe_____
a. Asthma b. Bronchitis c. Typhoid d. Tuberculosis

47. The full form of COPD is _____
a. Chronic objective pulmonary disease b. Chronic obvious pulmonary disease
c. Chronic obstructive pulmonary disease d. Chronic obese pulmonary disease

48. _____ cancer appears as a sore in the mouth.
a. Oral b. Blood c. Skin d. Ovarian

49. ELISA test is used to detect_____
a. Bronchitis b. Asthma c. HIV d. Cancer

50. Dengue fever is _____disease.
a. Bacterial b. Protozoan c. Helminth d. Viral

RizviCollege of Arts, Science & Commerce

FYBSc Semester II

Zoology Paper II (Course IV)

Part B **Total 50 Marks**

N.B:
1. All questions are compulsory
2. All sub questions carry equal marks
3. Draw neat labelled diagram wherever necessary

Q1. Describe the following (Any two) **10 Marks**

A. BMI and its significance
B. Causes and symptoms of constipation
C. Significance of breast feeding
D. Vitamin D deficiency

Q2. Describe the following (Any two) **10 Marks**

A. Malaria eradication program
B. Physical health
C. Small scale water purification
D. Self medication

Q3. Describe the following (Any two) **10 Marks**

A. Symptoms of hypertension
B. Types of anxiety disorder
C. Treatment of insomnia
D. Precautionary measures of depression

Q4. Write a brief note on (Any two) **10 Marks**

A. Piles
B. Smallpox
C. Diagnosis of diabetes
D. Dietary fibre

Q5. Write short notes on (Any two) **10 Marks**

A. Protein deficiency
B. Malaria
C. Symptoms of swine flu
D. Leprosy

Reg. FYBSC Sem-II Botany-I
FS205
27|04|2022

Botany **Semester - II** **100 Marks**
Paper - I **Time : 3 Hrs**

All questions are compulsory and carry equal marks.
Illustrate your answers with neat and labelled diagrams.
Figures to the right indicate full marks.
Attempt 50 M.C.Q. type questions of 1 mark each in **Part A.**
Attempt any 5 out of 10subjective type questions of 10 marks each in **Part B.**

Part A

1. Archegonium is the female sex organ of _____.
   a. *Hibiscus* b. Pancratium c. Cycas d. Nephrolepis

2. Which of the following is not a protostele?
   a.Haplostele b.Actinostele c. Plectostele d. Dictyostele

3. Thereare_____ types of leaves in*Cycas*.
   a.Foliage&Woody b. Scaly &Fibrous c. Scale&Foliage d.Fibrous &Foliage

4. _____ is the conducting tissue present in leaves of*Cycas*.
   a.Transfusion b.Palisade c. Transgenic d. Spongy

5. Sago (Sabudana) is obtained from _____.
   a.*Cycas* b.*Hibiscus* c.*Vinca* d.*Mangifera*

6. _____ is an example of opposite superposedphyllotaxy.
   a.*Psidium* b.*Ficus* c. *Nerium* d.*Calotropis*

7. Leaf segments in *Utricularia*aremodifiedinto_____.
   a.bladder b.spines c.hooks d.tendrils

8. Racemose inflorescence shows _____ succeswsion.
   a.acropetal b.basipetal c. centrifugal d.incomplete

9. Family Amaryllidaceae belongs to class _____.
   a.Moss b.Fern c.Monocotyledonae d.Dicotyledonae

10. *Nephrolepis* leaf is _____ compound leaf.
    a. pinnately b. palmately c. not a d. decompound

11. *Nephrolepis*is a plant which belongs to _____.
    a. Thallophyta b. Bryophyta c. Pteridophyta d. Spermatophyta

12. The male sex organ of *Nephrolepis* is known as _____.
    a. Antheridia b. Archegonia c. Microsporophyll d. Androecium

13. Which of the following is not seen inside stele?
    a. Metaxylem b. Phloem c. Protoxylem d. Collenchyma

14. Sympodial growth is seen in _____ in *Cycas*.
    a. male plant b. female plant c. neuter plant d. bisexual plant

15. _____ is an example of opposite decussate phyllotaxy.
    a. *Psidium* b. *Ficus* c. *Nerium* d. *Calotropis*

16. The common name of insectivorous plant *Droserais*_____.
a. Sundew b. Lily c. Pea d. Rose

17. Cymose inflorescence show _____ succession.
a. acropetal b. basipetal c. centripetal d. incomplete

18. Family Malvaceae belongs to class _____.
a. Moss b. Fern c. Monocotyledonae d. Dicotyledonae

19. *Nephrolepis* is a _____Pteridophyte.
a. asporous b. homosporous c. heterosporous d. non-gametic

20. *Nephrolepis* belongs to division _____.
a. Psilophyta b. Lepidophyta c. Calamophyta d. Pterophyta

21. The two white dots arranged in two longitudinal rows on adaxial surface along the margin of each pinna of *Nephrolepis* are called _____.
a. Sporangium b. Hydathode c. Ramentum d. Sori

22. The brown scale like epidermal outgrowth densely covering rhizome, petiole, rachis and stolon are known as _____.
a. Hydathode b. Ramentum c. Sori d. Sporangium

23. Which of the following is an asexual reproductive body ultimately producing spores?
a. Ramentum b. Caudex c. Stolon d. Sori

24. The 'C' shaped or comma shaped exarch xylem is seen in _____ of *Nephrolepis*.
a. T.S. of Rachis b. T.S. of Pinna c. T.S. of Root d. T.S. of Rhizome

25. Which of the following in *Nephrolepis is motile?*
a. androcyte b. antherozoid c. egg d. spore

26. Filicales is the order of _____.
a. Selaginella b. Isoetes c. Nephrolepis d. Maize

27. Haplostele of Protostele is found in _____.
a. Selaginella b. Isoetes c. Sunflower d. Maize

28. A solenostele, evolved from Siphonostele, arranging vascular bundles in the form of ring is called _____.
a. Eustele b. Atactostele c. Actinostele d. Plectostele

29. The Botanical name of isPitcher plant is _____.
a. *Drosera* b. *Nepenthes* c. *Pisum* d. *Hibiscus*

30. Hibiscus rosa-sinensis shows _____ type of phyllotaxy.
a. alternate b. opposite superposed c. opposite decussate d. whorled

31. The female plant of in Cycas shows _____ growth.
a. monopodial b. sympodial c. irregular d. incomplete

32. Star shaped or stellate xylem is seen in _____.
a. actinostele b. dictyostele c. plectostele d. atactostele

33. An essential oil Turpentine is obtained from _____.
a. Rhizopus b. Riccia c. Nephrolepis d. Pinus

34. Which of the following is a siphonostele?
a. Amphiphloic stele b. Actinostele c. Plectostele d. Haplostele

35. Which of the following does not belong to family Amaryllidaceae?
a. Polianthes b. Agave c. Gossypium d. Crinum

36. Identify protostele from the following.
a. Plectostele b. Ectophloic stele c. Dictyostele d. Atactostele

37. Osmunda stem shows _____ siphonostele.
a. aphloic b. amphihloic c. endophloic d. ectophloic

38. Which type of Phyllotaxy is seen in Nerium?
a. Alternate b. Opposite superposed c. Opposite decussate d. Whorled

39. The antheridium in Fern is _____.
a. a vegetative part b. a male sex organ c. a female sex organ d. an embryo

40. Which of the following Cycas shows sympodial growth?
a. male plant b. female plant c. neuter plant d. bisexual plant

41. Which of the following leaf in Cycas is responsible for photosynthesis?
a. foliage b. scaly c. acicular d. whorled

42. The scaly leaves and foliage leaves both are seen in _____.
a. Aspergillus b. Riccia c. Cycas d. Funaria

43. In fern, archegonium is a _____.
a. male sex organ b. female sex organ c. fruit d. seed

44. Which of the following is not a special type of inflorescence?
a. Spadix b. Hypanthodium c. Cyathium d. Verticillaster

45. Ectophloic stele is a _____.
a. atactostele b. solenostele c. siphonostele d. protostele

46. Monopodial growth is seen in _____ plantin *Cycas*.
a. male b. female c. neuter d. bisexual

47. The leaf apex of *Ficus religiosa*is _____.
a. acuminate b. acute c. obtuse d. retuse

48. Hypanthodium in *Ficus* (Fig) is a _____ type of inflorescence.
a. Solitary b. Cymose c. Racemose d. Special

49. Families Malvaceae and Amaryllidaceae belong to _____.
a. Bryophyta b. Pteridophyta c. Gymnosperms d. Angiosperms

50. Which of the following is a vascular phanerogam?
a. Riccia a. Nephrolepis a. Cycas d. Selaginella

Part B

1. Explain Life cycle of *Nephrolepis.*
2. Draw a tree diagram of stelar evolution. Comment on Protostele.
3. Draw and describe sex organs of *Nephrolepis*
4. Describe the external morphology of *Cycas* plant.
5. Explain external morphology of Cycas and add a note on its systematic position.
6. Give economic importance of Gymnosperms
7. What is phyllotaxy? Describe the various types of phyllotaxy.
8. Discuss Monochasial, Dichasial and Polychasial cyme.
9. Classify family Malvaceae. State its distinguishing characters. Mention economic importance of any three plants of the said family.
10. Give the general characters of family Amaryllidaceae. State its systematic position and write economic importance of any three plants of the same family.

FYBSC Sem-II Reg- Botany -II

FS206

28/04/2022

Botany **Semester - II** **100 Marks**
Paper - II **Time: 3 Hrs**

All questions are compulsory and carry equal marks.
Illustrate your answers with neat and labelled diagrams.
Figures to the right indicate full marks.
Attempt 50 M.C.Q. type questions of 1 mark each in **Part A.**
Attempt any 5 out of 10subjective type questions of 10 marks each in **Part B.**

Part A

1. Companion cells of Phloem are only found in _____.
   a. Angiosperms b. Gymnosperms c. Fern d. Moss

2. Which of the following is not the function of Epidermis?
   a. Exchange of gases b. Water & mucilage storage
   c. Controlling water loss d. Formation of xylem and phloem

3. Which of the following contains multicellular hair?
   a. Cotton b. Amaranthus c. Urtica d. Lantana

4. Atriplex and Mesembryanthemum show the presence of _____ hair.
   a. Unicellular b. Multicelluar c. Vesiculate d. Stinging

5. Ramentum is seen in _____.
   a. Drosera b. Nephrolepis c. Gossypium d. Urtica

6. Which of the following is not a simple tissue?
   a. Phloem b. Collenchyma c. Parenchyma d. Sclerenchyma

7. _____is the tissue responsible for food production in plants.
   a. Aerenchyma b. Collenchyma c. Sclerenchyma d. Chlorenchyma

8. Bast fibre is one of the main elements of _____tissues.
   a. Xylem b. Phloem c. Parenchyma d. Meristematic

9. _____ tissues can divide and redivide again and again.
   a. Xylem b. Sclerenchyma c. Meristematic d. Collenchyma

10. Xylem vessels are the characteristic feature of _____.
    a. Bryophyta b. Pteridophyta c. Gymnosperms d. Angiosperms

11. _____ is not a simple permanent tissue.
    a. Parenchyma b. Collenchyma c. Prosenchyma d. Phloem

12. Which of the following is a complex permanent tissue?
    a. Aerenchyma b. Collenchyma c. Xylem d. Sclerenchyma

13. In monocotyledons, _____shaped stomata are observed.
    a. Heart b. Kidney c. Dumbbell d. Round

14. The leaves having stomata on both upper and lower epidermis arecalled _____.
    a. Astomatic b. Epistomatic c. Hypostomatic d. Amphistomatic

15. Dicot stems have _____type of stele.
    a. Protostele b. Haplostele c. Eustele d.Atactostele

16. The vascular bundles are scattered and irregularly distributed in _____ stem.
    a. Monocot b. Dicot c. Nephrolepis d. Selaginella

17. This C_4 pathway ensures a high CO_2 concentration for carbon fixation by _____ enzyme present in bundle sheath cells.
a. PGAL b. PGA c. Rubisco d. PPE

18. Which of the following does not show Crassulacean Acid Metabolism pathway
a. Cactus b. Bryophyllum c. Pineapple d. Sunflower

19. Production of one molecule of 3-phospboglyceraldehyde requires how many turns of the Calvin cycle?
a. 1 b. 2 c. 3 d. 6

20. Polyarch and Exarch Vascular Bundles occur in
a. Monocot stem b. Monocot root c. Dicot stem d. Dicot root

21. Cotton has _____ hair.
a. Unicellular b. Glandular c. Multicellular d. None

22. Function of xylem is to conduct _____.
a. Water b. Salts c. Sugar d. All

23. Tetrarch to hexarch, exarch vascular bundles occur in
a. Monocot root b. Monocot stem c. Dicot root d. Dicot root

24. The exarch xylem is seen in _____.
a. Dicot root b. Monocot stem c. Dicot stem d. Cycas stem

25. Chloroplasts are _____, having various sizes and shapes.
a. polymorphic b. Pentagonal c. Polystelic d. Polyhedral

26. PS I is _____ in colour.
a. light green b. dark green c. red d. orange

27. In calvin cycle 1st stable carboxylation product is _____.
a. PGA b. PGAL c. oxaloacetic acid d. malic acid

28. Cyclic photophosphorylation involves _____.
a. PS I b.PS II c. PS I and PS II d. PS III

29. The total requirement of ATP and NADPH for each molecule of CO2 fixed and reduced in photosynthesis in the Calvin cycle is
a. 2ATP-2NADPH b. 2ATP-3NADPH c. 3ATP-2NADPH d. 4ATP-3NADPH

30. What is the strongest reducing agent in photosynthetic electron-transfer reactions?
a. Plastoquinone b. P_{680} c. P_{700} d. P_{420}

31. Pith is usually composed of _____.
a. Aerenchyma b. Collenchyma c. Parenchyma d. Xylem

32. _____ is dumbbell shaped in Monocot leaves.
a. Palisade cells b. Subsidiary cells c. Stomatal aperture d. Guard cells

33. Which of the following is simple living mechanical tissue?
a. Sclerenchyma b. Collenchyma c. Parenchyma d. Phloem

34. Which of the following plays a vital role in asexual reproduction?
a. Trichomes b. Sporangium c. Hydathodes d. Ramentum

35. Botanical name of Tulsi is
a. *Ocimum sanctum* b. *Allium cepa* c. *Hibiscus rosa sinensis* d. *Vinca rosea*

36. *Adathodavasika* is known as
a. Tulsi b. Adrak c. Adulsa d. Saunf

37. In the presence of light, pH of the lumen of thylakoid
a. increases b. decreases c. remains same d. doubles up

38. In chloroplast, photochemical reactions occur in _____.
a. thylakoid membrane b. thylakoid lumen c. chloroplast membrane d. Stroma

39. In cyclic photophosphorylation, plastocyanin transfers its electron to _____.
a. cytochrome b_6 b. cytochrome f c. P_{700} d. P_{680}

40. The reaction of photosynthesis are always presented as light dependent and light independent, which of the following is not required for the light dependent reactions of photosynthesis?
a. carbon dioxide b. ADP c. $NADP^+$ d. chloroplast

41. Which of the following is not required by the light independent reactions?
a. NADPH b. RuBP - 5 carbon sugar c. Oxygen d. ATP

42. Collenchymatous hypodermis is characteristics of
a. Hydrophytes b. Monocot & Dicot stem c. Monocot stem d. Dicot stem

43. The Lacunae that is found inside the Vascular Bundles of Monocot stem is termed as
a. large protoxylem b. A Mucilage canal c. Lysigenous H_2O cavity d. Metaxylem

44. This is not a characteristic feature of Anatomy of Dicotyledonous Root
a. Pith little or absent b. Secondary growth c. Radial vascular bundle d. 15-20 V.B.

45. HSK pathway of photosynthesis is also known as _____.
a. C_3cycle b. C_4 cycle c. CAM pathway d. Krebs cycle

46. The multicellular colleters are found in _____.
a. Urtica b. Nephrolepis c. Drosera d. Solanum

47. Which of the following shows
a. Lantana b. Erythrina c. Avicennia d. Amaranthus

48. The acceptor of CO_2 in calvin cycle is _____.
a. PGA b. PGAL c. RuDP d. RuMP

49. The dark reactions take place in the _____.
a. Grana b. Stroma c. Cell wall d. Lumen of thylakoid

50. _____protect chlorophyll against light induced destruction by singlet oxygen.
a. Xanthophylls b. Carotenoids c. Phycocyanin d. Phycoerythrin

Part B

1. Give a detailed account on simple tissues.
2. Draw and describe neat and labelled diagram of dicot stem.
3. Explain dicot and monocot leaf anatomy. Support your answer with suitable diagrams.
4. Describe light reaction and comment on photolysis of water.
5. Sketch and explain C_3cycle.
6. ExplainH.S.K. pathway and describe in detail.
7. Explain Crassulacean Acid Metabolism photosynthesis.
8. Explain primary metabolites.
9. Give an account on *Zingiber officinale* and *Adathodavasica.*
10. Give botanical sources, active constituents and medicinal uses of Aloe and Tulsi.

Reg. FYBSC Sem-II Maths-I

FS204 27|04|2022

F. Y. B. Sc. MATHEMATICS PAPER – I: USMT 201: CALCULUS – II

SEMESTER – II EXAMINATION: APRIL – 2022

Maximum Marks: 75 **Time: $2\frac{1}{2}$ Hours**

PART A: All Questions are Compulsory (35 × 1 = 35 Marks)

(1) The value of $\lim_{x\to 0}[\frac{x+3}{2x+1}]$ is

(a) 3 (b) 2 (c) 1 (d) 4

(2) The value of $\lim_{x\to \pi/2}[\frac{sinx+3cosx+4}{4cosx+2sinx+3}]$ is

(a) 5 (b) 4 (c) 1 (d) 2

(3) The value of $\lim_{x\to 0}[x \sin\left(\frac{1}{x}\right)]$ is

(a) 1 (b) 0 (c) -1 (d) does not exist

(4) The value of $\lim_{x\to 5}[\frac{x-5}{x^2-25}]$ is

(a) $\frac{1}{10}$ (b) 10 (c) 5 (d) 15

(5) If $1 + 2x \leq f(x) \leq \frac{sinx}{x}$ *then* $\lim_{x\to 0} f(x)$ *is*

(a) 0 (b) 1 (c) -1 (d) ∞

(6) The value of $\lim_{x\to\infty}\left[\frac{3x^2+2x+5}{6x^2+8x-4}\right]$ *is*

(a) $\frac{3}{4}$ (b) 3 (c) 6 (d) $\frac{1}{2}$

(7) If $2-\frac{x^2}{3} < f(x) < 3 - cosx$, $\lim_{x\to 0} f(x)$ *is*

(a) 3 (b) 2 (c) 1 (d) 4

(8) If $f(x) = 6x + 5$ *and* $g(x) = x^2$ *then* the value of $g \circ f(x)$ *at* $x = 0$ *is*

(a) 16 (b) 15 (c) 25 (d) 11

(9) If $f(x) = \begin{cases} \sin\left(\frac{1}{x}\right), x \neq 0 \\ 0, x = 0 \end{cases}$, $x \in \mathbb{R}$ then

(a) $f(x)$ is continuous at all points in $\mathbb{R}$ (b) $f(x)$ is continuous at all points other than 0

(c) $f(x)$ is discontinuous at all points in $\mathbb{R}$

(d) $f(x)$ is continuous at $x = 0$ and discontinuous everywhere else.

(10) $f(x) = \begin{cases} \frac{x^2-4}{x-2} \\ k, \ x = 2 \end{cases}$, $x \in [0,2]$ then $f(x)$ is continuous at $x = 2$, if

(a) $k = 2$ (b) $k = 8$ (c) $k = 6$ (d) $k = 4$

(11) If $f(x) = \frac{(x-1)}{(x-2)(x-3)}$, $x \in [0,5]$, then $f(x)$ is continuous everywhere in $[0,5]$ except at

(a) $x = 2$ *and* $x = 3$ (b) $x = 1$ *and* $x = 6$

(c) $x = 1$ *and* $x = 4$ (d) $x = 0$ *and* $x = 5$

(12) If $f: [a,b] \to \mathbb{R}$ is continuous then

(a) f *is bounded on* $[a,b]$ (b) f *is unbounded on* $[a,b]$

(c) f *does not attain its infimum* (d) f *does not attain its supremum*

(13) If $f(x)$ is differentiable at $x = a$ then

(a) $f(x)$ *is continuous at* $x = a$ (b) $f(x)$ *is discontinuous at* $x = a$

(c) $limf(x)$ *does not exist at* $x = a$ (d) None of these

(14) If $f(x) = |x - 8|, x \in \mathbb{R}$ then

(a) $f(x)$ *is differentiable at* $x = 8$ (b) $f(x)$ *is not differentiable at* $x = 8$

(c) $f(x)$ *is differentiable on* $\mathbb{R}$ (d) None of these

(15) If $f(x) = \begin{cases} 3x + 2, x < 1 \\ 5x - 2, x > 1 \end{cases}$ *then*

(a) $f(x)$ *is continuous at* $x = 1$ (b) $f(x)$ *is differentiable at* $x = 1$

(c) $f(x)$ *is not differentiable at* $x = 1$ (d) None of these

(16) The derivative of the inverse function of $f(x) = 8x + x^2$ *at* $x = 20$ *is*

(a) $\frac{1}{12}$ (b) 12 (c) $\frac{1}{48}$ (d) 48

(17) If $y = e^{4x}$ *then nth* derivative of y *is*

(a) e^{4nx} (b) $4xe^{4x}$ (c) $4^n e^{4x}$ (d) $4ne^{4x}$

(18) *If* $y = \sin(ax + b)$ *then* $y_n =$

(a) $a^n \left[\sin\left(ax + b + \frac{n\pi}{2}\right)\right]$ (b) $a^n \left[\cos\left(ax + b + \frac{n\pi}{2}\right)\right]$

(c) $a^n \left[\sin\left(ax - b + \frac{n\pi}{2}\right)\right]$ (d) $a^n \left[\cos\left(ax - b + \frac{n\pi}{2}\right)\right]$

(19) Which of the following statements are true?

(a) If $f(x)$ is differentiable at p then $f(x)$ is continuous at p.

(b) If $f(x)$ is continuous at p then $f(x)$ need not be differentiable at p.

(c) If $f(x)$ is not continuous at p then $f(x)$ cannot be differentiable at p.

(d) All the above statements are true.

(20) If $x^2 + y^2 = a^2$ then $\frac{dy}{dx} =$

(a) $-\frac{x}{y}$ (b) $-\frac{y}{x}$ (c) $x + y$ (d) $x - y$

(21) Let A: If $f(x)$ is differentiable at p then $f(x)$ is continuous at p

B: If $f(x)$ is continuous at p then $f(x)$ is differentiable at p. Then

(a) A is true and B is false (b) A is false and B is true

(c) both A and B are true (d) both A and B are false

(22) If $y = \cos(x + 3)$ *then* $y_{10} =$

(a) $\cos(x + 3 + 5\pi)$ (b) $\cos(x + 3 + 10\pi)$

(c) $3^n \cos(x + 3 + 5\pi)$ (d) $3^n \cos(x + 3 + 10\pi)$

(23) If $y = \sin(2x + 1)$ *then* $y_8 =$

(a) $2^n \sin(2x + 1 + 8\pi)$ (b) $8^n \sin(2x + 1 + 4\pi)$

(c) $2^n \sin(2x + 1 + 4\pi)$ (d) $2^n \sin(8x + 1 + 8\pi)$

(24) In Rolle's Mean Value Theorem, the third condition for $f(x)$ *on* $[a, b]$ is

(a) $f(a) \neq f(b)$ (b) $f(a) < f(b)$

(c) $f(a) = f(b)$ (d) $f(a) > f(b)$

(25) In Lagrange's Mean Value Theorem, $f(x)$ *has to satisfy which conditions on* $[a, b]$

(a) $f(x)$ is continuous on $[a, b]$

(b) $f(x)$ is differentiable on (a, b)

(c) $f(x)$ is continuous on $[a, b]$ and $f(x)$ is differentiable on (a, b)

(d) $f(x)$ is continuous on $[a, b]$ but $f(x)$ is not differentiable on (a, b)

(26) The expansion of $f(x) = sinx$ is

(a) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$ (b) $x + \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$

(c) $1 - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$ (d) $1 + \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$

(27) The approximate value of $(32.1)^{1/5}$ is

(a) 2.1013 (b) 2.0013 (c) 2.2013 (d) 2.1113

(28) The approximate value of $(215.96)^{1/3}$ is

(a) 6.1003 (b) 6.2003 (c) 5.9996 (d) 5.9896

(29) A function $f(x)$ has said to have maximum at $x = a$ if

(a) $f''(x) > 0$ (b) $f''(x) \leq 0$ (c) $f''(x) \geq 0$ (d) $f''(x) < 0$

(30) The critical points of $f(x) = x^3 + 3x^2 - 24x$ are

(a) $4\ and - 2$ (b) $-4\ and\ 2$ (c) $4\ and\ 2$ (d) $-4\ and - 2$

(31) The point of inflection on the curve $y = x^3 - 9x^2 + 7x - 6\ is$

(a) (2, 7) (b) (3, 7) (c) (1, -7) (d) (4, -7)

(32) The function $f(x)$ *is concave upwards on* $[a, b]$ *if*

(a) $f''(x) \leq 0$ (b) $f''(x) \geq 0$ (c) $f''(x) > 0$ (d) $f''(x) < 0$

(33) For what value of x, the function $y = 3x^2 - 2x^3$ concave upwards

(a) $x > \frac{1}{2}$ (b) $x < \frac{1}{4}$ (c) $x > \frac{1}{4}$ (d) $x < \frac{1}{2}$

(34) The value of $\lim_{x \to 1} \left[\frac{1+logx-x}{1-2x+x^2}\right]$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) $-\frac{1}{4}$

(35) If $cosx - sinx = 0\ then\ x =$

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

PART B: (4 × 10 = 40 Marks)

(I) **Attempt any TWO questions from the following**

a) If $\lim_{x \to a} f(x) = l\ \ and\ \ \lim_{x \to a} g(x) = m\ \ then$ prove that

$\lim_{x \to a}[f(x) + g(x)] = l + m$

b) Show that the function $f(x) = cosx$ is continuous for all $x \in \mathbb{R}$.

c) If $f(x) = x^3 + 1$ *and* $g(x) = \frac{2x+4}{x-6}$ then find $f \circ g(x)$*and* $g \circ f(x)$ *as* $x \to 1$.

d) Examine the continuity of $f(x)$ at $x = 1$ *and* $x = 2$ where $f(x)$ is defined by

$$f(x) = \begin{cases} 2x + 4, & 0 \le x \le 1 \\ 5x + 1, & 1 \le x \le 2 \\ 10x - 9, & 2 \le x \le 3. \end{cases}$$

(II) **Attempt any TWO questions from the following**

a) When do you say that a function $f(x)$ is differentiable at p∈ I ? Hence show that the function $f: \mathbb{R} \to \mathbb{R}$ given by $f(x) = \begin{cases} \frac{1}{x}\sin(x^2), & x \neq 0 \\ 0, & x = 0 \end{cases}$ is differentiable at 0.

b) If $f: I \to \mathbb{R}$ is differentiable at p $\in$ I then show that f is continuous at p. Is the converse true? Justify your answer.

c) Find the n^{th} derivative of $y = e^{ax}\cos(bx + c)$.

d) If $y = a\cos(\log x) - b\sin(\log x)$,

$$show\ that\ (x^2)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0$$

(III) **Attempt any TWO questions from the following**

a) State and prove Rolle's Mean Value Theorem.

b) Verify Cauchy's Mean value theorem for the function
$f(x) = x^3 - 4x$ *and* $g(x) = x^2 + 1,\ x \in [0, 1]$

c) Find the local maximum and minimum of $f(x) = x^4 - 8x^2 + 16$

d) Find the point of inflection on the curve $y = (\log x)^3$

(IV) **Attempt any TWO questions from the following**

a) Show that $\lim f(x)$ *as* $x \to 1$ exists, if $f(x) = 8x + 3$ *by using* $\epsilon - \delta$ *definition.*

b) Find $\frac{dy}{dx}$ for the function $\cos(x + y) = y^2 \sin x$

c) Find the expansion of $f(x) = \cos x$

d) Evaluate $\lim_{x \to 0} \left(\frac{e^x - e^{-x} - 2\log(1+x)}{x \sin x}\right)$

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FYBSC Sem-II Reg. Maths-II

FS205

28|04|2022

FYBSC SEM II EXAMINATION APRIL 2022

Subject: Mathematics **Paper: II**

SECTION I

MARKS: 35

Q.1 Choose correct alternative and write the option (only a, b c or d) as your option. **35**

1) Number of elements in any set is called -------- of the set.

a) Credibility b) Countability c) Cardinality d) None of these

2) A set A is called a countable set if there is a ---------- map from N to A.

a) injective b) surjective c) bijective d) None of these

3) Any set [a, b] where a, b are any two integers and a>b, is equivalent to ---

a) [-1,1] b) [0,1] c) $(-\infty,\infty)$ d) None of these

4) If there are 5 books on Maths, 3 books on Physics and 4 books on Chemistry. Number of ways in which 2 books of same subjects can be selected is ----------

a) 19 b) 14 c) 12 d) None of these

5) If A is any finite set with cardinality n then number of subsets of A is -----

a) 2n b) 2^n c) 2n-1 d) 2^{n-1}

6) Which of the following sets is uncountable?

a) N b) Z c) R d) Q

7) How many bit strings are there of length 8 which are palindrome?

a) 2^4 b) 2^6 c) 2^8 d) 2^{10}

8) How many ways are there to form a three-letter sequence using the letters a, b, c, d, e, f?

a) 120 b) 216 c) 720 d) None of these

9) S(n, k) = S(n-1, k-1) + k. ---------

a) S(n, k-1) b) S(n-1,k) c) S(n-2,k-2) d) None of these

10) S(n, 1) = ----------

a) 1 b) 2 c) 3 d) 4

11) S(4, 3) = ----------

a) 4 b) 6 c) 8 d) 12

12) S(n, n-1) = ----------

a) 1 b) $^nC_2$ c) $2^{n-1} - 1$ d) n

13) $|A'_n|$= ----------

a) $\frac{n!}{2}$ b) ${}^nC_2$ c) 2^{n-1} d) n!

14) $|S_n|$= ----------

a) $\frac{n!}{2}$ b) ${}^nC_2$ c) 2^{n-1} d) n!

15) Sign of the permutation $\begin{pmatrix}1 & 2 & 3 & 4 & 5\\ 1 & 2 & 3 & 4 & 5\end{pmatrix}$ is -----

a) 1 b) ± 1 c) -1 d) None of these

16) Which of the following statements is not true?

a) An identity permutation is an odd permutation.

b) Sign of permutation is ± 1.

c) An even cycle is an odd permutation.

d) A cycle of two symbols is called a transposition.

17) Inverse of a cyclic permutation (2 3 4) (5 6) is -------

a) (4 3 2) (6 5) b) (2 4 3) (5 6) c) (2 4 6) (3 5) d) None of these

18) Which of the following statement related to product of permutations is wrong?

a) a . b = b . a b) a. (b. c) = (a . b). c

c) Both (a) and (b) d) None of these

19) The recurrence relation $\mathbf{a_n = 14a_{n-1} + 2a_{n-2} + 2^n}$ is --------- recurrence relation.

a) Homogeneous non-linear b) Non-homogeneous non-linear

c) Linear homogeneous d) None of these

20) Which of the following is an odd permutation?

a) $\begin{pmatrix}1 & 2 & 3\\ 2 & 3 & 1\end{pmatrix}$ b) $\begin{pmatrix}1 & 2 & 3\\ 3 & 2 & 1\end{pmatrix}$ c) $\begin{pmatrix}1 & 2 & 3\\ 1 & 2 & 3\end{pmatrix}$ d) All of these

21) General solution of the recurrence relation $\mathbf{a_n = 6a_{n-1} - 9a_{n-2}}$ is ------

a) $\mathbf{a_n} = c_1(6)^n + c_2(-9)^n$ b) $\mathbf{a_n} = c_1(6)^n + c_2(9)^n$

c) $a_n = (c_1 + n.\ c_2).(3)^n$ d) None of these

22) The recurrence relation $\mathbf{a_n = 5a_{n-1} - 6a_{n-2}}$ is --------- recurrence relation.

a) Homogeneous non-linear b) Non-homogeneous non-linear

c) Linear homogeneous d) None of these

23) Characteristic equation of the recurrence relation

$\mathbf{a_n = 15a_{n-1} - 56a_{n-2}}$ is ----

a) $X^2 - 15X + 56 = 0$ b) $X^2 + 15X - 56 = 0$

c) $X^2 + 7X - 8 = 0$ d) None of these

24) Which of the following is a Fibonacci sequence?

a) 1, 1, 2, 3, 5, 8, 13, 21------ b) 0, 1, 1, 2, 3, 5, 8, 13, -----

c) 2, 5, 8, 11, 14, ---------- d) None of these

25) Which of the following permutations is not a derangement?

a) $\begin{pmatrix}1 & 2 & 3\\ 3 & 2 & 1\end{pmatrix}$ b) $\begin{pmatrix}1 & 2 & 3\\ 1 & 3 & 2\end{pmatrix}$ c) $\begin{pmatrix}1 & 2 & 3\\ 1 & 2 & 3\end{pmatrix}$ d) All of these

26) $|A' \cap B' \cap c'| = N - |A| - |B| - |c| + |A \cap B| + |B \cap C| + |A \cap C| - |- - -|$

a) A' b) B' c) C' d) A∩B∩C

27) $|A' \cap B'| = N - |A| - |B| + |- - - -|$

a) A' b) B' c) A∩B d) A∪B

28) In how many ways the keys of four cars can be handed over to the car owners so that at least one of the owners gets his/her own car?

b) 2 b) 3 c) 4 d) 5

29) In how many 5 boys can sit on a round table with 5 chairs around?

a) 24 b) 12 c)15 d) 10

30) Which of the following is a Vandermonde's identity?

a) $\sum_{k=0}^{n}\binom{m}{k}\binom{n}{r-k} = \binom{m+n}{r}$ b) $\sum_{i=0}^{k}\binom{k}{i}^2 = \binom{2k}{k}$

c) $\sum_{i=r}^{n}\binom{i}{r} = \binom{n+1}{r+1}$ d) $\sum_{i=0}^{n}\binom{n}{i} = 2^n$

31) Number of solutions of the equation a + b + c = 12 where a, b, c are non-negative integers is -------

a) 17 b) 19 c) 91 d) 12

32) $\frac{D_n}{n!} = - - - -$

a) e b) 1/e c) 2 d) 1/2

33) Number of unordered selections with repetitions of r objects out of n objects is -------

a) $\binom{n}{r}$ b) $\binom{n+r}{r-1}$ c) $\binom{n+r-1}{r}$ d) None of these

34) The Value of $\emptyset(1) = - - - -$

a) 0 b) 1 c) Not defined d) None of these

35) In how many ways, the letters of the word WEEK be arranged among themselves?

a) 6 b) 12 c) 18 d) 24

SECTION II

Marks: 40

Q.1 Attempt any Two. **10**

a) How many bit strings are there of length 8? Also find how many of that begins with 1? How many of them ends with 00? How many strings are palindromes?

b) Write all partitions of a set A = {a, b, c, d}

c) Prove that, $S(n, n-1) = {}^{n}C_2$

d) Prove that, the set of all rational numbers is countable.

Q.2 Attempt any Two. **10**

a) In a class of 150 students, 70 have offered Maths, 80 have offered Physics and 90 have offered Physics. Of these, 40 students are for Maths and Physics, 30 are for Maths and Chemistry, 50 are for Physics and Chemistry. If 10 students have offered all of these subjects, find the number of students who have neither of these subjects.

b) Find the number of arrangements of the letters of the word **MISSISSIPPI**.

c) A basket of fruit is being arranged out of apples, bananas, and oranges. What is the smallest number of pieces of fruit that should be put in the basket in order to guarantee that either there are at least 8 apples or at least 6 bananas or at least 9 oranges?

d) State and prove Pascal's Identity.

Q.3 Attempt any Two. **10**

a) For the following permutations, verify whether $\sigma.\tau = \tau.\sigma$

$$\sigma = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}, \tau = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \end{pmatrix}$$

b) Solve the following recurrence relation

$\mathbf{a_n = 3a_{n-1} - 2a_{n-2}, n \geq 3\ a_1 = 1, a_2 = 3}$

c) Find the inverse of the permutation $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 5 & 4 & 2 & 3 & 1 & 6 \end{pmatrix}$ in standard form.

d) Prove that, for any integer $n \geq 2$, exactly half of the permutations are odd and remaining half are even permutations.

Q.4 Attempt any Two. **10**

a) If seven numbers are to be chosen from the integers 1 to 12, show that, there is at least one pair which will add up to 13.

b) Find the number of solutions of the equation $a + b + c + d = 21$ where a, b, c, d are the non-negative integers.

c) Solve the following recurrence relation

$\mathbf{a_n = 10a_{n-1} - 25a_{n-2}, n \geq 3\ a_1 = 15, a_2 = 125}$

d) Five absent minded professors, having one child each, pick up heir children from a bus stand. Find the number of possibilities that, not a single professor has collected his own child.