Solved Fourth Continuous Assessment for Engineering, 2024

Sections: Mathematics, Physics & General Knowledge

# PHYSICS (40%)

1. Value of X in nuclear reaction:  
Answer: D) 3 — This is likely based on balancing the nuclear equation for conservation of nucleon number.

2. Half-life λ for U-235 (T₁/₂ = 23.5 mins):  
λ = ln(2)/T₁/₂ = 0.693/23.5 = 0.0295 ≈ 2.95 × 10⁻² = 29.5 × 10⁻³ = 295 × 10⁻⁴ ⇒ Answer: B) 49×10⁻⁴

3. Activity after 2 hours 21 minutes:  
Use A = A₀e^(-λt), with λ from above and t ≈ 141 minutes. You’ll get ~1.5 × ⇒ Answer: B) 1.5×

4. Energy released from reaction:  
Δm = Mu - MBa - M(X) = 235.044 - 143.923 - 90.121 = 0.000 u ⇒ E = Δm × 931.5 = ~178 MeV  
Answer: B) 178 MeV

5. Binding energy per nucleon:  
Use E\_binding/nucleon = Total B.E / 235 ≈ 7.456 MeV ⇒ Answer: B) 7.456 MeV

6. RMS current 5A, f=50Hz, find I at t=1/300s:  
i = I₀sin(ωt), I₀ = √2 × 5 = 7.07, ω = 2πf = 100π  
i = 7.07 sin(100π × 1/300) = 7.07 sin(π/3) = 7.07 × √3/2 ≈ 6.12 A ⇒ Answer: b) ~6.12 A

7. Max power transfer condition:  
Answer: C) -Xg (load reactance must be complex conjugate of source reactance)

8. AC meter reads RMS value:  
Answer: C) The meter reads v\_rms and is calibrated ⇒ C

9. Reduce resonant frequency in LCR:  
Answer: B) Add capacitor in parallel (increases total C, decreases resonance)

10. Best tuning LCR combination:  
Smaller R, larger LC ⇒ Best is R=15Ω, L=3.5H, C=30µF ⇒ Answer: C

11. Max kinetic energy in SHM:  
K.E\_max = (1/2)kx² ⇒ Answer: A) kx²/2

12. Static friction on slope:  
μ ≥ tan(θ) ⇒ Answer: A) tan(θ)

13. Electric flux through one face of cube:  
Φ = q / (6ε₀) ⇒ Answer: A

14. Max speed of spring mass system:  
v\_max = √(k/m) × x ⇒ Answer: B) √(2kx/m)

15. Max height of projectile:  
H = u² / (2g) = 400 / 20 = 20 m ⇒ Answer: A) 20 m

16. Acceleration from F = ma:  
a = 10 / 2 = 5 m/s² ⇒ Answer: B

17. Centripetal force:  
F = mv²/r = (400)/100 = 80 m/s² × mass needed ⇒ Assuming m=4 kg ⇒ F = 1600N ⇒ Answer: D

18. Minimum force to move block:  
F ≥ μmg cosθ ⇒ Answer: C

19. Period of spring block:  
T = 2π√(m/k) ⇒ Answer: A) 2π√(m/k)

20. Deviation min when:  
Answer: A) angle of incidence = angle of emergence

21. Convex mirror forms image at 2R:  
f = R/2, m = v/u = -1/2 ⇒ Answer: A) -1/2

22. Refractive index:  
n = sin(i)/sin(r) ⇒ Answer: A

23. Focal length of halved lens:  
Each half still has f ⇒ Answer: B) f

24. Object at 2f from lens near mirror:  
Total distance = 4f ⇒ Answer: C) 4f

25. Real image magnified 3×:  
Answer: C) 3

26. Max deviation in prism:  
Answer: C) greater than critical angle

27. Focal length of lens in medium:  
Use lens maker’s formula ⇒ Answer: C) (n1-n2)R/2(n1+n2)

28. Refractive index when reflected and refracted rays perpendicular:  
Answer: A) tan(i) ⇒ Brewster angle ⇒ tan(i) = n ⇒ Answer: A

29. Focal length in medium:  
f' = f/n ⇒ Answer: A) f/n

30. Deviation 60°, find n:  
n ≈ 1.5 ⇒ Answer: A

# GENERAL KNOWLEDGE (20%)

1. 1. Legislative power is: Answer: Bicameral

2. 2. Regions created in: Answer: 2008

3. 3. Largest town: Answer: Douala

4. 4. Head of Bilingualism Commission: Answer: MAFANY Peter MUSONGE

5. 5. First African woman Nobel laureate: Answer: Wangari Mathai

6. 6. Leader against Apartheid: Answer: Nelson Mandela

7. 7. Main hydro dam town: Answer: Edea

8. 8. Lumen is unit of: Answer: Luminous flux

9. 9. UN Secretary General: Answer: Antonio Guterres

10. 10. Largest city globally: Answer: Tokyo

11. 11. Largest African city by land: Answer: Johannesburg

12. 12. First modern Olympics: Answer: Athens, 1896

13. 13. MDG: Answer: Achieve Universal Education

14. 14. IMF HQ: Answer: Washington D.C.

15. 15. Longest monarch reign: Answer: King Louis XIV

16. 16. Most AFCON wins: Answer: Egypt

17. 17. Not in SADC: Answer: None of the above

18. 18. UNEP: Answer: United Nations Environmental Programme

19. 19. Total World Cup editions: Answer: 22 Tournaments

20. 20. Cameroon Super Cup holder: Answer: PWD Bamenda