# ATOMIC ENERGY EDUCATION SOCIETY

Anushaktinagar, Mumbai-400 094

## 2015 – Open Candidates Examination

Post – TGT (Maths/Physics) Date – 28.09.2015

Time – 1 Hour 30 Minutes Maximum Marks – 50

### Instructions

1. There are 50 Multiple Choice Questions (MCQ) in this paper. Each question carries 1 mark. There will be negative marking of 0.25 per wrong answer.
2. Answer should be darkened/marked in the OMR answer sheet only.
3. Use of any electronic gadget (e.g. calculator, mobile phone, etc.) is not permitted, in the examination hall.
4. In case a candidate has not signed the Attendance Sheet or the OMR Answer Sheet is not signed by the Invigilator, it will be dealt with as a case of unfair means.
5. On completion of the test, the candidates MUST HAND OVER THE OMR ANSWER SHEET AND QUESTION PAPER TO THE INVIGILATOR in the room/hall.
6. The candidates should ensure that the OMR answer sheet is not folded or damaged.

**To be filled by the candidate**

Name of the Candidate: _____

Roll Number: _____

OMR Number: _____

**No of printed pages –9**

**2015-Open Candidates- TGT (Maths/Physics) – QP**

Q.1) what is the domain and range of the function f(x) = of the function $f(x) = \sqrt{(16 - x^2)}$ ?

(a) [0,4], [0,4] (b) [0,4], [−4,4]

(c) [−4,4], [0,4] (d) [−4,4], [−4,4]

Q.2) Find the maximum value of $|-2 + Sin\,\theta|$.

(a) 3 (b) 2

(c) 1 (d) -1

Q.3) What is the argument of the complex number $-1-i\sqrt{3}$ ?

(a) $\frac{\pi}{3}$ (b) $\frac{-2\pi}{3}$

(c) $\frac{4\pi}{3}$ (d) $\frac{-\pi}{3}$

Q.4) A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of at most 3 girls ?

(a) 504 (b) 588

(c) 1035 (d) 1632

Q.5) The sum of n terms of two arithmetic progressions are in the ratio (5 n +4) : (9 n + 6). Find the ratio of their $18^{th}$ terms.

(a) $\frac{179}{121}$ (b) $\frac{221}{179}$

(c) $\frac{105}{177}$ (d) $\frac{177}{105}$

Q.6) $\frac{1}{1\times2} + \frac{1}{2\times3} + \frac{1}{3\times4} + \frac{1}{4\times5} + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots = ?$

(a) $\frac{n-1}{n}$ (b) $\frac{n}{n+1}$

(c) $\frac{n+1}{n}$ (d) $\frac{1}{n(n+1)}$

Q.7) Find the equation of the line passing through (- 3 , 5) and perpendicular to the line through the points ( 2 , 5 ) and ( - 3 , 6 ).

(a) $x + y + 20 = 0$
(b) $x - y + 20 = 0$
(c) $x + 5y + 20 = 0$
(d) $5x - y + 20 = 0$

Q.8) Find the equation of the hyperbola if foci $( \pm 3\sqrt{5} , 0 )$, the latus rectum is of length 8.

(a) $-4x^2 + 5y^2 = 100$
(b) $4x^2 - 5y^2 = 100$
(c) $4x^2 + 5y^2 = 100$
(d) $x^2 - 16y^2 = 80$

Q.9) $\tan 36^0 + \tan 9^0 + \tan 36^0 . \tan 9^0 = ?$

(a) -1
(b) 1
(c) 2
(d) - 2

Q.10) Let $A = Q \times Q$ and let * be a binary operation on A defined by $(a , b) * (c , d) = (ac , b + ad)$ for all $( a , b ), ( c , d )$ belongs to A then find identity element in A.

(a) ( 0 , 1 )
(b) ( 0 , 0 )
(c) ( 1 , 1 )
(d) ( 1 , 0 )

Q.11) $\tan \left[ 2 \tan^{-1} \frac{1}{5} - \frac{\pi}{4} \right] = ?$

(a) $\frac{-17}{7}$
(b) $\frac{17}{7}$
(c) $\frac{-7}{17}$
(d) $\frac{7}{17}$

Q.12) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ , $f(x) = x^2 - 2x - 3$ then find the value of $f(A)$.

(a) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
(b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
(c) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
(d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Q.13) $\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 1+3p+2q \\ 3 & 6+3p & 1+6p+3q \end{vmatrix} = ?$

(a) -1 (b) 1

(c) 2 (d) - 2

Q.14) If $f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$ when $x \neq 0$, $f(x) = k$ when $x = 0$ and $f(x)$ is continuous at $x = 0$ then the value of $k$ = ?

(a) a – b (b) a + b

(c) $\log a + \log b$ (d) $\log a - \log b$

Q.15) Differentiate $x^{x^x}$ with respect to 'x'.

(a) $x^{x^x} \cdot \left\{(1 + \log x)\log x + \frac{1}{x}\right\}$ (b) $x^{x^x} \cdot \left\{(1 + \log x)\log x + \frac{1}{x}\right\}$

(c) $x^{x^x} \cdot x^x \cdot \left\{(1 + \log x)\log x + \frac{1}{x}\right\}$ (d) none of these

Q.16) The points on the curve $9y^2 = x^3$, where the normal to the curve make equal intercepts with the axes are

(a) $(\pm 4, \frac{8}{0})$ (b) $(4, -\frac{8}{3})$

(c) $(4, \pm \frac{3}{0})$ (d) $(4, +\frac{8}{3})$

Q.17) $\int \sqrt{\sec x - 1}\, dx$ = ?

(a) $\log\left|\cos(x + \frac{1}{2}) + \sqrt{(\cos^2 x) + \cos x)}\right| + c$

(b) $\log\left|\cos(x - \frac{1}{2}) + \sqrt{(\cos^2 x) + \cos x)}\right| + c$

(c) $-\log\left|\cos(x + \frac{1}{2}) + \sqrt{(\cos^2 x) + \cos x)}\right| + c$

(d) $\log\left|\cos(x + \frac{1}{2}) + \sqrt{(\cos^2 x) - \cos x)}\right| + c$

Q.18) $\int_0^{\frac{\pi}{2}} (\sqrt{\tan x} + \sqrt{\cot x})\, dx = ?$

(a) $2\pi$ (b) $\sqrt{2}\,\pi$

(c) $2\sqrt{2}\,x$ (d) $\pi$

Q.19) Solve : $\frac{dy}{dx} \cos(x - y) = 1$

(a) $\tan(\frac{x-y}{2}) = y + c$ (b) $\cot(\frac{y-x}{2}) = y + c$

(c) $-\sin(x - y) = y + c$ (d) $\cot(\frac{x-y}{2}) = y + c$

Q.20) If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$, find the angle between $\vec{a}$ and $\vec{b}$.

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$

(c) $\frac{\pi}{6}$ (d) $\frac{\pi}{4}$

Q.21) If the lines $3x^2 - kxy - 3y^2 = 0$ and $x + 2y - 8 = 0$ form an isosceles triangle then k=

(a) 8 (b) 4

(c) $-4$ (d) $-8$

Q.22) Find the maximum value of $|2 - 5\sin\theta|$.

(a) 3 (b) 2

(c) 1 (d) -1

Q.23) A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of at most 3 girls?

(a) 504 (b) 588

(c) 1035 (d) 1632

Q.24) If A is a square matrix of order 2X2 and $|A| = 5$, then $|A(\text{adj}A)| =$

(a) 5 (b) 20

(c) 25 (d) 30

Q.25) If the slopes of the lines given by $3x^2 + kxy - y^2 = 0$ differ by 4, then the value of k is

(a) $k = \pm 1$ (b) $k = \pm 3$

(c) $k = \pm 2$ (d) $k = \pm 4$

Q.26) A vector A points vertically upward and a vector B points towards north. The vector product A X B is

(a) along west
(b) along east
(c) zero
(d) vertically downward

Q.27) A sine wave is travelling in a medium. A particular particle has zero displacement at a certain instant. The particle closest to it having zero displacement is at a distance. ($\lambda$ is the wavelength)

(a) $\lambda/4$
(b) $\lambda/3$
(c) $\lambda/2$
(d) $\lambda$

Q.28) The displacement of a particle in simple harmonic motion in one time period is (A is the amplitude)

(a) A
(b) 2A
(c) 4A
(d) Zero

Q.29) Rays from Sun converge at a point 15 cm in front of a concave mirror. Where an object should be placed so that the size of its image is equal to the size of the object?

(a) 15 cm in front of the mirror
(b) 30 cm in front of the mirror
(c) Between 15 cm and 30 cm in front of the mirror
(d) More than 30 cm in front of the mirror

Q.30) The desirable properties for making permanent magnets are

(a) High retentivity and high coercive force
(b) High retentivity and low coercive force
(c) low retentivity and high coercive force
(d) low retentivity and low coercive force

Q.31) A capacitor acts as an infinite resistance for

(a) DC
(b) AC
(c) DC as well as AC
(d) Neither AC nor DC

Q.32) Let p and E denote the linear momentum and energy of a photon. If the wavelength is decreased,

(a) both p and E increase
(b) p increases and E decreases
(c) p decreases and E increases
(d) both p and E decrease

Q.33) During a negative beta decay

(a) an atomic electron (located outside the nucleus) is ejected

(b) an electron which is already present within the nucleus is ejected

(c) a neutron in the nucleus decays emitting an electron

(d) a proton in the nucleus decays emitting an electron

Q.34) Two vectors A and B are A= 2 i+5 k and B=3j +4 k. Their scalar product is
(i, j, k are unit vectors along x,y & z axes respectively)

(a) 20 (b) 23

(c) $5\sqrt{33}$ (d) 26

Q.35) A body falling from a height of 10 m rebounds from the floor. If it loses 20 % of the energy in the impact, how high will it rebound?

(a) 10m (b) 8 m

(c) 12 m (d) 6 m

Q.36) A body falls freely from rest under gravity. If its speed is v when it has lost an amount V of gravitational potential energy, then its mass is
(assume mechanical energy is conserved)

(a) $vg/V^2$ (b) $V^2/g$

(c) $2V/v^2$ (d) $Vg/v^2$

Q.37) A person cannot see distinctly objects kept beyond 2 m. This defect can be corrected by using a lens of power

(a) +0.5D (b) -0.5D

(c) +0.2D (d) -0.2D

Q.38) An ideal Carnot's engine whose efficiency is 40% receives heat at 500 K. If the efficiency is to be 50% then the temperature of the source for the same temperature of the sink will be:

(a) 600 K (b) 800 K

(c) 1000 K (d) 1500 K

Q.39) A faulty thermometer has its fixed points marked $5^0$C and $95^0$C. The thermometer reads the temperature of the body as $59^0$C. The correct temperature on Celsius scale is

(a) $59^0$C (b) $60^0$C

(c) $45^0$C (d) $58^0$C

Q.40) A body executing S.H.M has a velocity 3 $ms^{-1}$ when at a distance 4m from the mean position and 4 $ms^{-1}$ when at a distance 3 m from the mean position. What is its amplitude of vibration?

(a) 3 m
(b) 4m
(c) 5 m
(d) 8m

Q.41) The position x of a particle varies with time t as $x=at^2-bt^3$. For what value of t acceleration is zero?

(a) 2a/3b
(b) a/b
(c) a/3b
(d) zero

Q.42) Given A=2i-j+2k and B=-i-2j+2k. The unit vector of A-B is:
(i, j, k are unit vectors along x,y & z axes respectively)

(a) $k/\sqrt{10}$
(b) $3i/\sqrt{10}$
(c) $(3i+j)/\sqrt{10}$
(d) $-3i+k/\sqrt{10}$

Q.43) Apparent weight of a body in a lift will be double of its real weight when

(a) Lift comes down with acceleration g
(b) Lift goes up with velocity 9.8 m/sec
(c) Lift goes up with acceleration g
(d) Lift goes down with velocity 9.8 m/sec

Q.44) Electromagnetic radiation with minimum wavelength is

(a) Ultraviolet rays
(b) Visible light
(c) Infrared rays
(d) Gamma rays

Q.45) According to Bohr's model of the hydrogen atom, the radius of the stationary orbit characterised by the principal quantum number n is proportional to

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

Q.46) A conducting circular loop of radius r carries a constant current I. It is placed in a uniform magnetic field $B_0$ such that $B_0$ is perpendicular to the plane of the loop. The torque acting on the loop due to the magnetic field is

(a) $i\pi B_0$
(b) $2\pi ir B_0$
(c) Zero
(d) $\pi ir B_0$

Q.47) A body is thrown vertically upward with velocity u. What is the greatest height H to which it will rise?

(a) u/g
(b) $u^2/2g$
(c) $u^2/g$
(d) u/2g

Q.48) The gravitational force between two objects is F. If masses of both objects are halved without changing distance between them, then the gravitational force would become

(a) F/4 (b) F/2

(c) F (d) 2 F

Q.49) A 10 mm long pin is placed vertically in front of a concave mirror. A 5 mm long image of the pin is formed at 30 cm in front of the mirror. The focal length of this mirror is

(a) -30 cm (b) -20 cm

(c) -40 cm (d) -60 cm

Q.50) In an electrical circuit two resistors of 2 Ω and 4 Ω respectively are connected in series to a 6 V battery. The heat dissipated by the 4 Ω resistor in 5 s will be

(a) 5 J (b) 10 J

(c) 20 J (d) 30 J

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## OPEN ADVERTISEMENT CANDIDATES EXAM-2015

**TGT (Maths/Physics)**

Answer Key

| | | | |
|---|---|---|---|
| 1 | C | 26 | A |
| 2 | A | 27 | C |
| 3 | B | 28 | D |
| 4 | D | 29 | B |
| 5 | A | 30 | A |
| 6 | B | 31 | A |
| 7 | D | 32 | A |
| 8 | B | 33 | C |
| 9 | B | 34 | A |
| 10 | D | 35 | B |
| 11 | C | 36 | C |
| 12 | A | 37 | B |
| 13 | B | 38 | A |
| 14 | B | 39 | B |
| 15 | C | 40 | C |
| 16 | D | 41 | C |
| 17 | C | 42 | C |
| 18 | B | 43 | C |
| 19 | D | 44 | D |
| 20 | B | 45 | D |
| 21 | A | 46 | C |
| 22 | A | 47 | B |
| 23 | D | 48 | A |
| 24 | C | 49 | B |
| 25 | C | 50 | C |