

# PRT Examination 2013 (AKU, Patna)

Subject: General Awareness (Paper - II)

Time: 1½ Hrs.

Full Marks: 50

Instruction: There are four options given for a question. You have to choose the correct option/s. Candidates are required to submit this Question Paper with answer book.

1.

The domain of the function  $f(x) = \sqrt{\frac{|x-1|}{|x|-2}}$  is

(a)  $x \in ]-\infty, -1[ \cup ]1, \infty[$  (b)  $x \in ]-\infty, -2] \cup ]2, \infty[$

(c)  $x \in ]-2, -1[ \cup ]1, 2[$  (d) None of these

2. If function  $f(x) = (x+1)^{\log x}$  is continuous at  $x=0$ ,  $f(0)$  must be defined as,

(a)  $f(0) = 0$  (b)  $f(0) = e$  (c)  $f(0) = \frac{1}{2}e$  (d) None of these

3. If  $f(x) = \frac{\sin[x]}{[x]}$ ,  $[x] \neq 0 \Rightarrow 0$ ,  $[x] = 0$  where  $[x]$  denotes the greatest integer less than or equal to  $x$  then  $\lim_{x \rightarrow 0} f(x)$  is equal to (a) 1 (b) 0 (c) -1 (d) None of these

4. The function  $f(x) = x(x+3)e^{-x/2}$  satisfy all conditions of Rolle's theorem in the interval  $[-3, 0]$ . Then the value of  $c$  is: (a) 0 (b) 1 (c) 2 (d) -2

5. If  $Z = xyf(xy)$ , then  $x \frac{\partial Z}{\partial x} + y \frac{\partial Z}{\partial y} =$

(a)  $Z$  (b)  $0$  (c)  $\frac{1}{2}Z$  (d)  $2Z$

6. Two of the eigenvalues of a  $3 \times 3$  matrix, whose determinant equals 4, are, -1 and +2. The third eigenvalue of the matrix is equal to (a) -2, (b) -1, (c) 1, (d) 2

7. The matrix  $A$  is defined as

$$A = \begin{bmatrix} -1 & 0 & 0 \\ 2 & -3 & 0 \\ 1 & 4 & 2 \end{bmatrix}. \text{ The eigenvalues of } A^2 \text{ are}$$

(a)  $-1, -9, -4$  (b)  $1, 9, 4$  (c)  $-1, -3, 2$  (d)  $1, 3, -2$

8. An  $n \times n$  homogeneous system of equations  $AX=0$  is given the rank of  $A$  is  $r < n$ . Then the system has

(a)  $(n-r)$  independent solutions (b)  $r$  independent solutions  
(c) no solution (d)  $(n-2r)$  independent solutions

9. Let  $A$  and  $B$  be two matrices, such that  $A=0, AB=0$ , the equation always implies that

(a)  $B=0$  (b)  $B \neq 0$  (c)  $B=-A$  (d)  $B=A'$

10. ~~The vector defined by~~ Let  $f(x,y,z)=c$  represents the equation of a surface. The unit normal to this surface is

(a)  $\text{grad}(f)/|\text{grad}(f)|$  (b)  $\text{grad}(f)$  (c)  $\text{div}[\text{grad}(f)]$  (d)  $\text{curl}[\text{grad}(f)]$ .

11. If  $f(z)$  is analytic and equals  $u(x,y)+iv(x,y)$ , then  $f'(z)$  equals

(a)  $\frac{\partial u}{\partial x} - i \frac{\partial u}{\partial y}$  (b)  $\frac{\partial u}{\partial x} - i \frac{\partial v}{\partial x}$  (c)  $\frac{\partial v}{\partial y} - i \frac{\partial v}{\partial x}$  (d) none of these.

12. The Cauchy integral theorem states "If  $f(z)$  is analytic in a simple connected domain  $D$ , then  $\int_C f(z) dz = 0$  on every simple closed path  $C$  in  $D$ ". The conditions of analytic in this theorem is

(a) necessary (b) necessary and sufficient (c) sufficient (d) none of these

13. The solution of boundary value problems for heat conduction in a rod for  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ ,  $u(0,t) = u(l,t) = 0$   
 $u(x,0) = 100 \frac{x}{l}$

(a)  $u(x,t) = \frac{100}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin \frac{n\pi x}{l} \cdot e^{-\frac{c^2 n^2 \pi^2}{l^2} t}$  (b)  $u(x,t) = \frac{200}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin \frac{n\pi x}{l} \cdot e^{-\frac{c^2 n^2 \pi^2}{l^2} t}$

(c)  $u(x,t) = \frac{100}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \cdot \cos \frac{n\pi x}{l} \cdot e^{-\frac{c^2 n^2 \pi^2}{l^2} t}$  (d) none of these

14. The inverse Laplace transform of  $\frac{e^{-2s}}{s^3}$  is

(a)  $(t-2)u_2(t)$  (b)  $(t-2)^2 u_2(t)$  (c)  $(t-2)^3 u_2(t)$  (d)  $(t+3)u_3(t)$

15. If  $f(x,y) = e^{xy^2}$  the total differential of the function at the point (1,2) is

- (a)  $e(dx+dy)$  (b)  $e^4(dx+dy)$  (c)  $e^4(4dx+dy)$  (d)  $4e^4(dx+dy)$

16. The value of  $n$  so that  $e^{ny^2}$  is an integrating factor of the differential equation  $(\frac{y}{2} - xy)dy - dx = 0$  is

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

17. A fair dice is tossed 7 times. The probability that a 5 or a 6 occurs at least once is

- (a)  $1 - (\frac{1}{3})^7$  (b)  $1 - (\frac{2}{3})^7$  (c)  $(\frac{2}{3})^7$  (d)  $(\frac{1}{3})^7$

18. The mean and standard deviation of an examination in which grades 70 and 88 corresponds to scores of -0.6 and 1.4, respectively are

- (a)  $\bar{x} = 75.4, \sigma = 9$  (b)  $\bar{x} = 9, \sigma = 75.4$   
 (c)  $\bar{x} = 75, \sigma = 9.4$  (d)  $\bar{x} = 9.4, \sigma = 75$

19. If  $X$  is normal with mean 2 and standard deviation 3, then the distribution of  $Y = \frac{1}{2}X - 1$  is

- (a)  $N(0, \frac{9}{4})$  (b)  $N(1, \frac{9}{4})$  (c)  $N(0, \frac{3}{4})$  (d)  $N(1, \frac{3}{4})$

20. Which vector is a probability vector?

- (a)  $(\frac{1}{4}, \frac{3}{2}, -\frac{1}{4}, \frac{1}{2})$  (b)  $(\frac{5}{2}, 0, \frac{8}{3}, \frac{1}{6}, \frac{1}{6})$   
 (c)  $(\frac{1}{12}, \frac{1}{2}, \frac{1}{6}, 0, \frac{1}{4})$  (d)  $(3, 0, 2, 5, 3)$

21. Three horses A, B, C are in a race, A is twice as likely to win as B, and B is twice as likely to win as C. Probability that B or C wins,  $P(B \cup C) =$
- (a)  $\frac{2}{7}$  (b)  $\frac{3}{4}$  (c)  $\frac{3}{7}$  (d)  $\frac{4}{7}$
22. A biased coin with probability  $p$ ,  $0 < p < 1$  of heads is tossed until a head appears for the first time. If the probability that the number of tosses required is even be  $\frac{2}{5}$ , then  $p$  equals
- (a)  $\frac{1}{3}$  (b)  $\frac{2}{3}$  (c)  $\frac{2}{5}$  (d)  $\frac{3}{5}$
23. If  $X$  is a Poisson variate such that  $P(X=2) = [9 \cdot P(X=4) + 90 \cdot P(X=6)]$ , the mean of the distribution is (a) 1 (b) 2 (c) 3 (d) 4
24. The relationship between mean  $\mu$ , variance  $\sigma^2$  and the second moment about the origin  $\mu_2'$  is
- (a)  $\sigma^2 = \mu - \mu_2'$  (b)  $\sigma^2 = \mu_2' - \mu^2$  (c)  $\sigma^2 = \mu_2' + \mu$   
 (d) None of these.
25. A second degree polynomial passes through  $(0, 3)$ ,  $(1, 6)$ ,  $(2, 11)$ ,  $(3, 18)$  and  $(4, 27)$ . The polynomial is
- (a)  $x^2 + x + 1$  (b)  $x^2 + 2x + 3$  (c)  $x^2 + 2x + 1$  (d)  $x^2 + x + 2$
26. If  $n=4$ , the value of integral  $\int_1^9 x^2 dx$  by Trapezoidal rule is  $2 \left[ \frac{1}{2}(1+9^2) + \alpha^2 + \beta^2 + 7 \right]$ , then
- (a)  $\alpha=1, \beta=3$  (b)  $\alpha=2, \beta=4$  (c)  $\alpha=3, \beta=5$  (d)  $\alpha=4, \beta=6$

27. Simpson's one-third rule for evaluation of  $\int_a^b f(x) dx$  requires the interval  $[a, b]$  to be divided into
- an even number of subintervals of equal width
  - an odd number of subintervals of equal width
  - any number of subintervals of equal width
  - any number of subintervals
28. Which of the following method always converges to root of the equation  $f(x) = 0$  ?
- Newton's - Raphson method
  - secant method
  - Regula false method
  - All of the above
29. The unit digit of  $2^{100}$  is
- 2
  - 4
  - 6
  - 8
30. The last digit of  $(38)^{1031}$  is
- 8
  - 6
  - 4
  - 2
31. Let  $M = \{(a_1, a_2, a_3) : a_i \in \{1, 2, 3, 4\}, a_1 + a_2 + a_3 = 6\}$ .  
Then the number of elements in  $M$  is
- 8
  - 9
  - 10
  - 12
32. Total number of ~~equation~~ divisions and multiplications required for solving a system of 5 equations using Gauss elimination method are
- 113
  - 208
  - 65
  - 45
33. In a group of cows and hens, the number of legs are 14 more than twice the number of heads. The number of cows is
- 5
  - 7
  - 10
  - 12
34. which city will host World Trade Fair or EXPO 2020?
- Milan
  - Shanghai
  - New Delhi
  - Dubai
35. which film won this year's Oscar for Best Picture?
- Argo
  - life of pi
  - skyfall
  - Lincoln
36. who is the winner of Miss India 2013?
- Kaaya Aproz
  - lisa Ray
  - Navneet kaur Dhillon
  - Sobhita Dhulipala
37. who is the new president of Bangladesh?
- M.A. Wazed Miah
  - Sheikh Hasina
  - Zillur Rahman
  - Abdul Hamid

38. Who is the longest serving defence minister in India?  
 a) George Fernandez b) Jaswant Singh c) A.K. Antony d) Pranab Mukherjee
39. Winner of 2013 Nobel Prize in Physics:  
 a) F. Englert and P.W. Higgs b) Alice Muroo c) M. Kasper d) M. Levitt
40. ~~The first female Prime Minister of United Kingdom was~~  
 a) Margaret Thatcher b) Milka Planinc c) Golda Meir d) Elisabeth Domitien
41. The new communication satellite launched by NASA on 31<sup>st</sup> January 2018 to stay in touch with its space station astronauts is  
 a) Tracking and Data Relay Satellite  
 b) NASA Relay Satellite  
 c) Space Tracking Satellite  
 d) Space Communication Satellite
42. The soldiers were instructed to \_\_\_\_\_ restraint and handle the situation peacefully.  
 a) exercise b) control c) prevent d) remain
43. Ravens appear to behave \_\_\_\_\_, actively helping one another to find food.  
~~mysteriously~~ b) wisely c) aggressively d) cooperatively
44. Crumb: Bread ::  
 a) ounce: unit b) splinter: wood c) water: bucket d) twine: rope
45. A way of doing something, especially a systematic way; implies an orderly logical arrangement (usually in steps)  
 a) research b) theory c) method d) steps
46. I don't trust politicians. I never have, and I \_\_\_\_\_.  
 a) will never b) never will c) never do d) never would
47. Give the antonym of 'foreake'  
 a) abandon b) sustain c) chastise d) grace
48. You probably feel quite cold today but actually, fifteen degrees is \_\_\_\_\_ hot for England in October.  
 a) simply b) pretty c) completely d) absolutely
49. When writing an academic paper, it is of utmost importance that a properly cross-referenced \_\_\_\_\_ is included, listing all papers and published texts that the writer has made reference to.  
 a) thesis b) biography c) bibliography d) journal

50. After thousands of miles of use, the tread on many bike tires wears down. One common theory about why tires wear down contends that the perpetual friction and heat generated by the contact between the tire and pavement erode the material on the surface of the tire. However, a local scientist who is also an avid cyclist proposed a new theory for why bike tires wear down. This scientist ~~contended that chemicals from the road's composition and~~ chemicals from rain residue wore down the surface of the tire. Which of the following would best evaluate the veracity of the scientist's proposed theory?
- Ride a road bike aggressively through spring rain storms.
  - Place chemicals from rain water and pavement on a bike's idle tires.
  - Ascertain whether chemicals from the road's composition also reside within the bike's frame.
  - Ascertain whether the bike's frame is made of rust-resistant components.

