SAMPLE QUESTION FOR UG ADMISSION TEST

ECONOMICS DEPARTMENT

PRESIDENCY UNIVERSITY

Group A: English [Full Marks: 30]

Read the following passage carefully and answer the following question. The answer must be in the candidate's own words but remaining confined to the content of the passage. One can write the answer in Bengali as well.

The virtues of tolerance and neighbourliness are paramount in securing a free society. Genuine liberty requires an acceptance of styles of life different from our own, combined with some degree of social trust and fellow feeling. There is, in one sense, a tension between these two virtues: tolerance can easily become apathetic and neighbourliness can easily become meddlesome. I will argue, though, that avoiding both intolerance and apathy is not a matter of finding the correct balance between two extremes on a single dimension. Humanistic concern for the welfare of others is not a moderated form of paternalism, and tolerance is not a moderated form of indifference. It is possible to simultaneously have high levels of the good sort of community and the good sort of individualism.

No matter how hard we try to come up with political institutions which promote liberty, it will be impossible to overcome a populace which is overwhelmingly bigoted or otherwise illiberal: garbage in, garbage out. A free society does not, of course, require that people approve of the lives of others, but merely that they respect the rights of individuals to live their own lives as they see fit.

Simple indifference towards others, though, is not sufficient for freedom. Informal institutions, which rely on the "social capital" produced in a trusting and cohesive society, are also a crucial element. People need the ability to cooperate in order to pursue their goals. Enforcement costs would be overwhelming if people were always out to fleece one another. Trust advances freedom by lubricating social relationships, reducing the frequency with which force must be resorted to as a means of dispute resolution.

Neighbourliness also allows people to more effectively protect their freedom against those who would take it from them. Our rights would often go unprotected without the help of our fellow people. A bystander will intervene to protect the vulnerable from violence only in a society with a sufficient level of social capital, and a neighbor will only take notice of a stranger walking out of your house with your television if he knows who you are. Professional police, whether provided voluntarily or through the state, are an important means of protection against aggression, but cannot completely replace the vigilance of a community.

On the one hand, excessively bigoted or paternalistic sentiments erode freedom by encouraging people to take coercive action against externally harmless activities; on the other, excessively self-regarding preferences preclude the social capital needed to ensure that the rights of the weak are upheld. If people have too much concern with the affairs of others, they will not let them live their lives. If people have too little concern, they will not defend their fellows against the coercive actions of others. We need then, to carefully consider which institutional arrangements best promote the virtues of tolerance and neighbourliness.

Q. How does the author envision the working of tolerance and neighbourliness in promoting a liberal society?

Group B: Mathematics [Full Marks: 70]

Answer all questions. Put √ mark against the correct option. You will get **2 marks** for a correct answer and **-0.5** for an incorrect one. Rough work may be done in booklet marked "M".

1. If between any two quantities we insert two arithmetic means A_1, A_2, two geometric means G_1, G_2 and two harmonic means H_1, H_2, then-
(a) $G_1G_2/H_1H_2 = (A_1+A_2)/(H_1+H_2)$ (b) $G_1G_2/(H_1+H_2) = (A_1+A_2)/H_1H_2$
(c) $(A_1+A_2)/H_1 = (G_1+G_2)/H_2$ (d) $(H_1+H_2)/(A_1+A_2) = G_1G_2$

2. If $2^n - 2^{n-1} = 4$, then n^n is equal to
(a) 1 (b) 4 (c) 27 (d) 256

3. The number of seven-digit numbers that can be formed with the digits 1,2,3,4,3,2,1 such that odd digits always occupy odd places is –
(a)144 (b) 18 (c) 630 (d) 5040

4. For any complex number z, the minimum value of $|z| + |z - 1|$ is
(a)0 (b) ½ (c)1 (d) 3/2

5. If the roots of the equation $lx^2 + mx + m = 0$ are in the ratio p:q, then -
(a) $\sqrt{p/q} + \sqrt{q/p} + \sqrt{m/l} = 0$ (b) $\sqrt{p/q} + \sqrt{q/p} + \sqrt{m/l} = 1$
(c) $\sqrt{p/q} + \sqrt{q/p} + \sqrt{m/l} = -1$ (d) $\sqrt{p/q} + \sqrt{q/p} + \sqrt{m/l} = 2$ ml

6. The sum to n terms of the series $1, 2a, 3a^2, 4a^3, 5a^4, \ldots\ldots$ is
(a) $1 - a^n/(1-a)^2 - na^n/(1-a)$ (b) $1 - a^n/(1-a) - a^n/(1-a)^2$ (c) $na^n/(1-a)^n$ (d) $na^{n-1}/1-a^n$

7. The value of $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$ is
(a) $(a+b+c)^3$ (b) $(a-b-c)^3$ (c) $(a-b-c)^2$ (d) $(a+b+c)^2$

8. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$ where $i^2 = -1$ then
(a) $(A+B)^2 = A^2 + B$ (b) $(A+B)^2 = A^2 - B^2$ (c) $(A+B)^2 = A^2 + 2AB + B^2$ (d) $(A+B)^2 = AB$

9. A straight piece of wire 40 cm long is cut into two pieces. One piece is bent into a circle and the other is bent into a square. How should wire be cut so that the total area of both circle and square is minimized?
(a) (18.6, 22.4) cm (b) (17.6, 22.4) cm (c) (17.6, 22.8) cm (d) (16, 22) cm

10. Trader Joe's sells bananas for 19 cents each. Let N be the number of bananas sold and let p be the price of a single banana. If Trader Joe's sells 300 bananas in a given day, and dN/dp = - 10, find out the number of bananas sold should the price for a banana be increased to 20 cents.
(a) 290 (b) 210 (c) 250 (d) 165

11. If $f(x) = ax^4 + bx^2$ and $ab>0$, then?
(a) the curve has no horizontal tangents b) the curve is concave up for all x
(c) the curve is concave down for all x (d) the curve has no inflection point

12. The sum of two positive numbers is 10. One of the numbers is multiplied by the square of the other. If each number is greater than 0, find the numbers that make this product a maximum.
(a) 1,9 (b) 5,5 (c) 7,3 (d) 6,4

13. The width of a rectangle is half its length. At what rate is the area of the rectangle increasing when its width is 10 cm and is increasing at ½ cm/sec?
(a) 5 cm^2/sec (b) 10 cm^2/sec (c) 20 cm^2/sec (d) None of the above.

14. Find out dy/dx from $x^3 - xy + y^3 = 1$
(a) $(3x^2)/(x - 3y^2)$ (b) $(3x^2 - 1)/(1 - 3y^2)$ (c) $(y - 3x^2)/(3y^2 - x)$ (d) $(3x^2 + 3y^2 - y)/x$

15. The value of $\int \frac{2x dx}{x^2+3}$ is
(a) $\log(x^2+3) + c$ (b) $e^{x^2-3} + c$ (c) $2(x^2+3) + c$ (d) $2\log(x^2+3) + c$

16. If the derivative of velocity(v) with respect to time(t) is acceleration (a) and if a = 2t, the value of v in terms of t assuming that v = 0 if t = 0 is (a) $v = 2t$ (b) $v = t^2$ (c) $v = 2$ (d) $v = t^2 + c$

17. The area enclosed between the x-axis, the lines x = 3, x = 7 and the line y = x is
(a) 1 (b)20 (c)9/2 (d)49/2

18. The solution of the differential equation dy/dx = -y/x is
(a) a circle (b) a straight line (c) a rectangular hyperbola (d) an ellipse

19. The value of $\int x\log x dx$ is
(a) $\log x + c$ (b) $(x^2\log x)/2 - x^2/4 + c$ (c) $(x\log x)/2 - x^2/4 + c$ (d) $(x^2\log x)/2 - x^2/2 + c$

20. The solution of $(x+y)^2\, dy/dx = a^2$ is
(a) $y = a\tan^{-1}(x+y)/a + c$ (b) $y = a\tan(x+y)/a + c$
(c) $y = \tan(x+y) + c$ (d) $y = a\log(x+y)/a + c$

21. The value of $\int_0^1 xe^x\,dx$ is (a) 0 (b) 1 (c) e^x (d) e

22. The value of $\lim_{x\to\infty} x^{\frac{1}{x}}$ is a) 0 (b) 1 (c) $\frac{1}{x}$ d) does not exist

23. The value of $\lim_{x\to 4} \frac{x-4}{x^2-x-12}$ is (a) $\frac{1}{3}$ (b) 1 (c) $\frac{1}{7}$ (d) does not exist

24. Let $f(x) = \begin{cases} \frac{x^2-1}{x-1}, & if\ x \neq 1 \\ 4 & if\ x = 1 \end{cases}$

Which of the following statements are true?
I. $\lim_{x\to 1} f(x)$ exists
II. $f(1)$ exixts
III. f is continuous at $x = 1$

a) I only (b) II only (c) I and II (d) All of them

25. The value of $\lim_{x\to\infty} \frac{3^x-3^{-x}}{3^x+3^{-x}}$ is (a) ∞ (b) 1 (c) 0 (d) -1

26. A triangle is formed by the co-ordinates (0,0) , (21,0) and (0,21). Then the number of integral co-ordinates strictly inside the circle is
(a) 190 (b) 105 (c) 231 (d) 205

27. If non-zero numbers a,b,c are in H.P., then the straight line $\frac{x}{a} + \frac{y}{b} + \frac{1}{c} = 0$ always passes through a fixed point. That point is (a) (1, -1/2) (b) (1, -2) (c) (-1, 2) (d) (-1, -2)

28. For what values of c does the straight line y = 2x + c intersect the circle $x^2+y^2=5$?
a) $-5 \le c \le 5$ (b) $c \le -5$ (c) $c \ge 5$ (d) none

29. The number of parabolas that can be drawn if two ends of the latus rectum are given is
(a) 1 (b) 2 (c) 3 (d) 4

30. The equation $\sqrt{(x-2)^2 + y^2} + \sqrt{(x+2)^2 + y^2} = 4$ represents
(a) a parabola (b) a hyperbola (c) an ellipse (d) x-axis

31. Let A and B be the probability of the two events such that $P(A \cup B) = 5/6$, $P(A\cap B) = 1/3$ and $P(A^c) = ½$. Then: (a) A and B are mutually exclusive (b) P(A) = P(B) (c) A and B are independent (d) $P(B) \le P(A)$

32. Suppose a point is picked at random in the unit square. Let A be the event that it is in the triangle bounded by the line y = 0, x= 1 and x=y, and B be the event that it is in the rectangle with vertices (0, 0), (1, 0), (1, ½) and (0, ½). The value of $P(A\cup B)$ is: (a) 5/8 (b) 3/8 (c) ½ (d) 3/5

33. Assume that cars are equally likely to be manufactured on Monday, Tuesday, Wednesday, Thursday or Friday. Cars made on Monday have a four percent chance of being *lemons* (car of poor quality); cars made on Tuesday, Wednesday or Thursday have a one percent chance of being *lemons*; and cars made on Friday have a two percent of being a *lemon*. If you brought a car and it turned out to be a lemon what is a probability that it was manufactured on Monday? (a) 1/3 (b) 2/3 (c) 2/9 (d) 4/9

34. If three distinct numbers are chosen randomly from the first 100 natural numbers, then the probability that all three of them are divisible by both 2 and 3 is: (a) 4/25 (b) 4/35 (c) 4/33 (d) 4/1155

35. A unit vector along the vector $\hat{i} + \hat{j}$ is:
(a) $0.5\hat{i} + 0.5\hat{j}$ (b) $\frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}$ (c) $0.5\hat{i} - 0.5\hat{j}$ (d) $\hat{i} - \hat{j}$