Pokhara University

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| Level: Bachelor | Semester – Fall | Year : 2012 |
| Programme: BE | | Full Marks: 100 |
| Course: Problem Solving Techniques | | Pass Marks: 45 |
| Time : 3hrs. |

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| *Candidates are required to give their answers in their own words as far as practicable.* |
| *The figures in the margin indicate full marks.* |
| Attempt all the questions. |

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|  | 1. Determine how many zeros end the number 300! + 1215 × 2510 . 2. What is the last digit of 365221. 3. Suppose you are told in advance that 10 of the cattle present are lame, and only have three feet. But the count yields 120 heads and 300 feet. How many cattle and how many people are there? | 5  5  5 |
|  | 1. Prove the law of cosines: given a triangle Δ ABC, if α the angle determined by sides AB and AC, then |BC|2=|AB|2+|AC|2-2|AB||AC| cosα. 2. Consider a polyhedron with 5 triangular faces meeting at each vertex. How many faces, vertices and edges will it have? | 8  7 |
|  | 1. A game is played by two players. They begin with a pile of 30 chips, all the same. For his or her move, a player may remove 1 to 6 chips. The player who removes the last chips wins. What strategy can the first player use so that he will always win? 2. Draw a planar grid that is 13 squares wide and 9 square high. How many different non-trivial rectangles can be drawn, using the lines of the grid to determine the boundaries?  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | 7  8 |
|  | 1. Suppose you have 9 pearls. They all look the same, but 8 of them have equal weight and one is different. The odd pearl is either lighter or heavier; you do not know which. The only equipment that you have at hand is balance scale. How can you use the scale to find the odd pearl with its weight in just three weighing? 2. Calculate the sum:   1 | 8  7 |
|  | 1. Which is greater, sin(cosx) or cos(sinx)? 2. Suppose that x is an angle and that tan (x/2) is rational. Verify that then sin x, cos x are both rational. Also show that |cosx-sinx| . | 7  8 |
|  | 1. A general needs to take his troops across the river. He spies two boys with a small boat. He commandeers both the boats and the river. But the boat will hold two boys or one soldier. Everyone is capable of rowing the boat. He determines a method for getting his troops across. What could it be? 2. The following sequence has become known as the John H. Conway sequence. Explain how it has formed. Also write two more terms. 1,1,1,3,1,4,1,1,3,6,1,2,3,1,4,8,1,3,3,2,4,1,6.. ..? 3. You have a piece of paper with a circle of radius between 2’’ and 4’’ drawn on it. You have a plastic square of side 10’’. You have no ruler and compass. How can you find the center of the circle? | 5  5  5 |
|  | Write short notes on **any two:**   1. Pythagorean Theorem 2. Use of Problem Solving Techniques 3. Prove by Contradiction 4. Solid Geometry | 2×5 |