TOPOLOGY II - MID-SEMESTRAL EXAM

Time : 2 hours   Max. Marks : 40

Answer all questions. You may use results proved in class after correctly quoting them. Any other claim must be accompanied by a proof.

(1) Decide whether the following statements are *True* of *False*. Answers without correct and complete justifications will not be given any marks.
   (a) S^n is a deformation retract of $\mathbb{R}^{n+1} - 0$.
   (b) The universal cover of a connected graph is contractible.
   (c) A finite index subgroup of a free group of rank 2 is finitely generated.
   (d) If X and Y are connected spaces having homeomorphic universal covers, then X and Y are homeomorphic.
   (e) Every map $f : \mathbb{R}P^2 \to X$ into a connected graph is null homotopic. $[4 \times 5 = 20]$

(2) Constrct a connected covering space of $S^1 \vee S^1$ corresponding to the normal subgroup of $\pi_1(S^1 \vee S^1)$ generated by a^2, b^2. Here a, b have the usual meaning. $[10]$

(3) Describe the connected coverings of $\mathbb{R}P^2 \times \mathbb{R}P^2$ up to covering space isomorphism. $[10]$