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**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY
WAKNAGHAT, SOLAN**

Test-III (December-2019)

PhD (1st SEM)

Course name: Research Methodology

Max Marks: 25

Course Code: 18P1WGE101

Max Time: 2 Hrs

Note: ~~All Questions are compulsory~~ Attempt any five questions

1. Discuss the mechanism of spin current formation in a lateral spin valve with the help of suitable diagram. [5]
2. Explain the momentum-dependent splitting of spin bands in two-dimensional condensed matter systems; also give details of spin Hall Effect. [5]
3. Discuss any novel method of thin film fabrication with suitable diagram. Also, discuss the steps to control the thickness of the film. Suggest 3 types of the films that could be fabricated using the method. [5]
4. Explain with suitable diagram spin injection, transportation and detection in semiconductor spin devices. [5]
5. Focus on the different types of GMR structures, also define their applications. [5]
6. What do you understand by giant magneto resistance? Discuss its mechanism in detail. [5]
7. (i) Explain the structure of non-local spin valves. Discuss different stages of spin current formation using an example of non-local spin valve. [3]
(ii) How a pure spin current can be obtained in a device, what are other components mixed in a spin current show diagrammatically. [2]