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**EIGHTH SEMESTER**

**B.Tech.**

**MID SEMESTER EXAMINATION**

**MARCH-2019**

**PT404**

**POLYMER PRODUCT AND DIE DESIGN**

**Time: 1:30 Hours**

**Max. Marks: 30**

**Note:** Answer all questions.  
All questions carry unequal marks. Draw neat diagram wherever necessary. Assume suitable missing data, if any.

1. [A] What is the effect of increase in molecular weight on the properties of poly ethylene? [1]
  - [B] What is the effect of blending 2 or more polymers on their physical and mechanical properties? Give one example. [1]
  - [C] What is the difference between LDPE and HDPE? [1]
  - [D] What is the effect upon shrinkage between semi crystalline and amorphous thermoplastics? [1]
  - [E] What do the term 3Fs and 3Ms indicate in a simple visualization of injection moulding process? [1]
  - [F] Describe the material selection process. [1]
  - [G] Time dependent permanent deformation is ----- [1]  
a) Plastic Deformation, b) Elastic Deformation, c) Creep, d) Anelastic
  - [H] How elastic modulus in materials arises from? [1]  
a) Weak Bonds, b) High Strength of Bonds, c) Combination of both, d) None
2. [A] What are the 2 characteristic differences between amorphous and crystalline plastics? [2]
  - [B] Short term plastic data must never be used for engineering design. Elaborate? [2]

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- [C] Draw a figure of Creep and Stress Relaxation phenomenon. [2]
- [D] What is Factor of Safety? [2]
- [E] Define the difference between strength and stiffness? [2]

3. [A] Parabolic semi segment OAB is bounded by X Axis, Y Axis and a parabolic curve having its vertex at A on the Y axis. The equation of the curve is  $y=f(x) = h(1-x^2/b^2)$  in which **b** is the base and **h** is the height of the semi segment. Locate the centroid of the semi segment. [4]

[B] PEEK is to be reinforced with 30% by volume of unidirectional carbon fibers and the properties of the individual materials is given below. [4]

- a) Calculate the density, modulus and the strength of the composite in the fiber direction,
- b) Calculate the fraction of the applied force which will be taken by the fibres.

	Material Density(kg/m <sup>3</sup> )	TensileStrength(GN/m <sup>3</sup> )	Modulus(GN/m <sup>2</sup> )
PEEK	1300	0.058	3.8
Carbon Fibre	1800	2.1	400

4. A cemented carbide cutting tool used for machining contains 75 weight percent WC, 15 weight percent TiC, 5 weight percent TaC and 5 weight percent CO. Estimate the density of the composite. The densities of the components are  $\rho_{WC}=15.77 \text{ g/cm}^3$ ,  $\rho_{TiC}=4.94 \text{ g/cm}^3$ ,  $\rho_{TaC}=14.5 \text{ g/cm}^3$ ,  $\rho_{CO}=8.90 \text{ g/cm}^3$  [4]

END