Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Fire Engineering III **Semester: V**
Program: B.Tech(FSE)
Course Code:HSFS3022
Time: 03 hrs. **Max. Marks: 100**
Instructions: Please read all instructions carefully

SECTION A

1. **Each question carry 4 Marks**
2. **Instruction: Choose the correct answer**

S. No.		CO
Q 1	Fire screens are used to decrease the intense heat transfer and restrict spread of fire. Brief about fire resistance screen and its application	**CO1**
Q 2	Discuss fire resistance partition and how it is important in a building.	**CO1**
Q 3	Discuss the parameters affecting the fire resistance rating of a building material.	**CO1**
Q 4	Briefly explain the terms i) Thermal diffusivity iii) Poisson ratio ii) Coefficient of thermal expansion iv) Spalling	**CO2**
Q 5	A wooden beam requires a cross section of 200 mm x 300 mm to resist the dead load and live load coming over it. Determine the cross section required, if it has to resist a fire of 4 h duration. Assume the rate of combustion as 0.3 mm / min	**CO2**

SECTION B

3. **Each question carry 10 Marks**
4. **Instruction: Write short/brief notes**

Q 6	Characteristics of building material have major significance analyzing building materialistic properties with respect to rise in temperature during any major fire. Justify the role of analyzing thermal conductivity, thermal capacity and thermal diffusivity of any two building material with respect to temperature rise.	**CO3**
Q 7	Explain principle of calculation of fire resistance limit of structural members. Also discuss about factor influencing coefficient of fire resistance.	**CO3**
Q 8	As per NBC illustrate all the hazards and building occupancies enlisted. **OR** Structural members of a building are being protected from fire in various forms. Discuss in detail of various protection measures of structural members.	**CO4**
Q 9	A building has a square plan with a floor area of 400 m^2 and has windows on opposite walls. If the fire load of the building is 75 kg/m^2 with a window opening of 50% and the floor to ceiling height as 3.0m, calculate the fire resistance period required for the building.	**CO4**

SECTION-C

1. **Each question carry 20 Marks**
2. **Instructions: Write long answer.**

Q 10	Discuss fire resistant partition in detail with its types. Also highlight the purpose of providing fire resistant partition along with factors contributing increasing fire resistance rating of partition members. OR Performance criteria of any structural members design consideration subjected to fire. Also discuss the time temperature curve in brief. Taking ASTM E119 time temperature curve calculate the Temperature after 3 hours (t_h) given the ambient temperature as 25°C.	**CO4**
Q 11	Calculate the ultimate load N_u for fire resistance rating of 2 hours. A 300 mm x 400 mm column with 6 X 4 bars (diameter of 12 mm) that is 3.90 meters in length. The column is eccentrically loaded, with hinges at both ends. The column has a fire resistance rating of 2 hours based on ISO 834 standard fire exposure. Also given that the $\lambda = kL/r = 67.5$ Assume k = 1.0 (effective length) $A_c = 0.06m^2$ $A_s = 6.8*10^{-4}\ m^2$ $a_1 = 0.3 * A_c^{-0.5} = 1.22$ $a_2 = A_c^{-0.25} = 2.02$ Parameters: A_c = 200 x 300 mm; 6 ϕ 12 mm; L = 3.90 m c = 25 mm; e = 20 mm; hinged at both ends f_c = 35.7 N/mm^2; f_y = 493 N/mm^2; R_f = 120 min	**CO 5**