

**POST GRADUATE DIPLOMA IN FIRE SAFETY
AND DISASTER MANAGEMENT
(PGDFSTYDM)**

Term-End Examination

June, 2012

00456

MSE-007 : FIRE ENGINEERING SCIENCE

Time : 3 hours

Maximum Marks : 100

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- Note :** 1. *Question No. 1 is compulsory.*
2. *Attempt any four questions from remaining.*
3. *Log table and non - programmable calculators
can be used.*
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1. (A) Tick the correct answers : **2x10=20**
- (a) How water is lifted in suction column during priming ?
- (i) By venturi effect
- (ii) By atmospheric pressure
- (iii) By centrifugal force
- (iv) By suction affect of pump

- (b) A pump can empty a tank in 30 minutes, where as another pump can empty the same tank in 20 minutes. How much time it would take to empty the tank if both pumps operate together ?
- (i) 10 minutes (ii) 12 minutes
(iii) 15 minutes (iv) 17 minutes
- (c) When is the pressure energy highest in centrifugal pump discharge cycle ?
- (i) In Volute (ii) In Impellers
(iii) In Delivery Hose (iv) In branch pipe
- (d) Water is flowing in 63 mm Hose at 4m/sec velocity. Find out discharge in L.P.M (Approx.).
- (i) 650 Ltrs (ii) 748 Ltrs
(iii) 856 Ltrs (iv) 933 Ltrs
- (e) What amount of current is flowing in a bulb of 60 W in domestic supply of 240 volts ?
- (i) .10 Amps (ii) .15 Amps
(iii) .25 Amps (iv) .50 Amps
- (f) Find out brake power of a pump discharging 2400 LPM at 4 bars pressures if efficiency is 50%:
- (i) 16 kW (ii) 20 kW
(iii) 24 kW (iv) 32 kW

- (g) A LPG Cylinder was involved in a fire, which was filled at 15 bars pressure at 27°C. Its temperature went up to 67°C, find the pressure inside cylinder.
- (i) 17 bars (ii) 21 bars
 (iii) 27 bars (iv) 30 bars
- (h) Water evaporates from surface of a rectangular tank having internal dimension of 3x2 meters at the rate of 70 cms. per week. How many minutes daily would a 20 mm pipe with water flowing at the rate of 2 meters per second have to be opened to compensate evaporation.

$$\text{(Hint LPM} = \frac{VD^2}{20} \text{)}$$

- (i) 8 minutes (ii) 10 minutes
 (iii) 12 minutes (iv) 15 minutes
- (i) What term will satisfy very Rapid Oxidation with high pressure and noise ?
- (i) Spontaneous combustion
 (ii) De - flaggeration
 (iii) Explosion
 (iv) Back draught
- (j) Which principle of fire extinction is satisfied mainly by dry chemical powders when applied on liquid fuel fires ?
- (i) Cooling (ii) Starvation
 (iii) Smothering (iv) Chain inhibition.

(B) Fill in the blanks :

2x10=20

- (a) A temperature reading of -40° F is equal to _____ $^{\circ}$ Kelvin.
- (b) If pressure at a nozzle is doubled and diameter of nozzle halved, what will be impact on Jet reaction _____ .
- (c) Heat required to convert 1 gm of water at 0° C in to steam will be _____ Calories.
- (d) Weight of one litre of kerosene with .85 specific gravity would be _____ kgs.
- (e) Flammable gas with highest _____ is considered as most dangerous.
- (f) The Temperature above which a gas can not be liquified by pressure alone, is known as _____.
- (g) A rolling ball on plain ground stops at its own due to _____.
- (h) Weight of a body is multiplication of mass and _____.
- (i) Water in _____ form will affect highest cooling.
- (j) In an ideal gas, volume is directly proportional to _____ if pressure remain constant.

2. Give short notes on *any three* of the following :
- (a) Power, Work and Force 3x5=15
 - (b) Causes of generation of Static Electricity
 - (c) Tetra - hedron of Fire
 - (d) Flammability Range
 - (e) Effect of Heat on Substances
3. (a) A rectangular reservoir is to be filled with water. The dimensions of tank are 8m x 5m x 3m. If the tank can be filled in 1 hrs 40 minutes by 30 mm nozzle and the pump is 50% efficient, find the brake power of pump. 8
- (b) State the principles of Pressure in fluids in the Light of Bernaulis Theorem. 7
4. (a) Give Chemical reaction of following : 8
- (i) Carbon burning in Oxygen
 - (ii) Sodium - bi - Carbonate solution is mixed with Aluminium Sulphate
 - (iii) Dry chemical powder is applied on metal fire
 - (iv) Rusting of Iron
 - (v) BCF applied on fuel fire
- (b) Define density, Specific gravity and Vapour density. Why study of these terms is useful to fireman ? 7

5. What are effects of Heat on substances ? How does heat transfers in a body ? Explain with reference to different states of material, which is invariably base for hazard analysis. 15
6. What are basic characteristics of water ? Explain the use of water as fire fighting media, its advantages and disadvantages. Also name the materials on which use of water is restricted with reasons . 15
7. (a) What do you understand by friction factor ? What are the principles governing pressure loss due to friction ? 8
- (b) A branch is working at a height of 14 meters above pump level and the pressure at branch is 4.0 bars. Total bend loss is .55 bars, pump is working at 7.5 bars. Calculate the discharge for 20 mm nozzle and total friction loss. 7
8. (a) What are gas Laws ? Explain. 8
- (b) What do you understand by Flammability Range and what are the principles to prevent a gas reaching flammability range ? 7