

KATHMANDU UNIVERSITY  
End Semester Examination  
February/March, 2019

Marks Scored:

Level : B.Sc.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : PHYS 202

Semester: I

F. M. : 20

Registration No.:

Date FEB 25 2019

SECTION "A"  
[20Q. × 1 = 20 marks]

Choose and tick the most appropriate answer. The symbols have their usual meanings.

- A stream function is defined  
[a] only for incompressible flow  
[b] for irrotational flow  
[c] when the flow is continuous  
[d] only for steady flow
- Given the velocity vector in a flow  $\vec{V} = -x\hat{i} + 2y\hat{j} + (3-z)\hat{k}$ . Then the magnitude of acceleration at a point (1, 1, 2) is  
[a]  $\sqrt{6}$  [b] 6 [c] 18 [d]  $\sqrt{18}$
- For two dimensional flow given by  $\vec{V} = 2x^3\hat{i} - 6x^2y\hat{j}$ , the flow is  
[a] rotational every where  
[b] irrotational every where  
[c] rotational except at the origin  
[d] irrotational except at the origin
- A control volume implies  
[a] an isolated system [b] a closed system  
[c] a specified mass in a fluid flow [d] a fixed region in space
- For a fluid with very low Reynolds number, which of the following is NOT true?  
[a] terminal velocity is high [b] terminal velocity is low  
[c] kinematic viscosity is high [d] dynamic viscosity is high
- For fluid flow through orifices, the coefficient of velocity  $C_v$  is expressed as  
[a]  $C_v = \frac{\sqrt{2gH}}{V_{\text{actual}}}$  [b]  $C_v = C_d\sqrt{2gH}$  [c]  $C_v = AC_d\sqrt{2gH}$  [d]  $C_v = \frac{V_{\text{actual}}}{\sqrt{2gH}}$
- Which of the following correctly represents the expression for Venturimeter constant?  
[a]  $C = \frac{A_1\sqrt{2g}}{\sqrt{A_1^2 - A_2^2}}$  [b]  $C = \frac{A_1A_2\sqrt{2g}}{\sqrt{A_1^2 - A_2^2}}$  [c]  $C = \frac{A_1\sqrt{2g}}{\sqrt{A_1^2 + A_2^2}}$  [d]  $C = \frac{A_1A_2\sqrt{2g}}{\sqrt{A_1^2 + A_2^2}}$
- For a circular orifices, the value of discharge coefficient is nearly equal to  
[a] 0.6 [b] 0.4 [c] 0.3 [d] 1

9. The x-component of velocity in a two dimensional incompressible flow over a solid surface is  $u = \frac{3}{2}y - \frac{1}{2}y^2$ . Where  $y$  is measured from the solid surface in a direction perpendicular to it. Then the rotational velocity at (3,2) is  
 [a]  $\frac{1}{4}$                       [b]  $-\frac{1}{4}$                       [c]  $\frac{1}{2}$                       [d]  $-\frac{1}{2}$
10. Two capillaries of same radii but different lengths  $l_1$  and  $l_2$  are connected in parallel combination. What would be the length of a single tube to maintain the same flow rate?  
 [a]  $\frac{l_1 l_2}{l_1 + l_2}$                       [b]  $\frac{l_2}{l_1 + l_2}$                       [c]  $\frac{l_1 l_2}{l_1 - l_2}$                       [d]  $\frac{l_1}{l_1 + l_2}$
11. The volume rate of flow of liquid through a pipe of radius  $r$  and length  $L$  when the flow is laminar is  $V_0$ . Keeping the pressure difference across the pipe unchanged if the pipe is replaced by another pipe of the same length but of radius  $2r$ , the volume rate of flow of liquid through the pipe will be equal to  
 [a]  $V_0$                       [b]  $2 V_0$                       [c]  $8 V_0$                       [d]  $16 V_0$
12. Let  $\phi = C_1$  and  $\psi = C_2$  are velocity potential and stream function for a given flow, then angle between these lines are  
 [a] always less than  $90^\circ$                       [b] always greater than  $90^\circ$   
 [c] always equal to  $90^\circ$                       [d] can not be determined
13. The conditions for flow beyond the boundary layer and its outer edge are  
 [a]  $\frac{\partial u}{\partial y} = 0$  and  $u = U_\infty$                       [b]  $\frac{\partial u}{\partial y} = \infty$  and  $u = U_\infty$   
 [c]  $\frac{\partial u}{\partial y} = 1$  and  $u = U_0$                       [d]  $\frac{\partial u}{\partial y} = 0$  and  $u = U_0$
14. The circulation per unit area for a forced vortex is equal to  
 [a]  $\omega$                       [b]  $2\omega$                       [c]  $\omega^2$                       [d] 0
15. A laminar boundary layer has a velocity distribution given by  $\frac{u}{U_\infty} = \frac{y}{\delta}$ . The displacement thickness  $\delta_1$  for the boundary layer is  
 [a]  $\delta$                       [b]  $\frac{\delta}{2}$                       [c]  $\frac{3\delta}{4}$                       [d]  $\frac{3\delta}{8}$
16. The trace of the motion of fluid particles can be monitored by injecting a dye to the flow. Such a trace in an unsteady flow is called a .....
17. For turbulent flow over flat plate, the distance between the point of instability and fully developed turbulent condition is known as .....
18. The average value of skin friction coefficient  $\bar{C}_f$  is equal to .....
19. In Couette flow with zero pressure gradient, the shear stress  $\tau$  at the boundary is .....
20. The intensity of turbulence is given by .....