Name: Registration number: Category:

Subject: Fluid Mechanics

- Every correct answer carries 1 mark.
- For every incorrect answer, you will get negative marks of 0.25
- There are a total of 10 questions each in Engineering mechanics, maths and Fluid mechanics section.

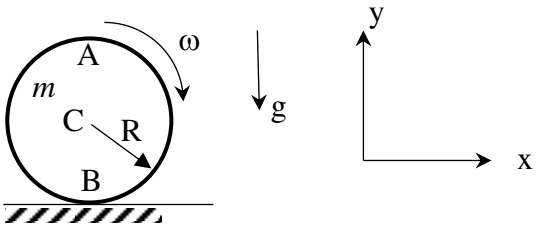
1.	11.	21.
2.	12.	22.
3.	13.	23.
4.	14.	24.
5.	15.	25.
6.	16.	26.
7.	17.	27.
8.	18.	28.
9.	19.	29.
10.	20.	30.

Q1) The location of point P is (x=1, y=1, z=0). The speed of P is 2m/s and the rate of change of speed is 0.2m/s^2. The centre of curvature of the path taken by P lies at (1, 2, 0) at this instant. Then the acceleration of P, at this instant, is:

a) (0.2**i** + 4**j**) m/s^2 ☐
b) **(±0.2i + 4j)** m/s^2 ☐
c) (0.2**i** ± 4**j**) m/s^2 ☐
d) (±0.2**i** ± 4**j**) m/s^2 ☐

Q2) A disc of mass *m* and axial moment of inertia *I* about the centre of mass *C* is in plane motion with angular velocity ω. At this instant $|V_A| < 2\,\omega\,R$. At this instant the kinetic energy of the disc w.r.t. the ground is:

a) $\frac{1}{2}m(V_A - \omega R)^2 + \frac{1}{2}I\omega^2$ ☐
b) $\frac{1}{2}m(V_A)^2 + \frac{1}{2}(I + mR^2)\omega^2$ ☐
c) $\frac{1}{2}m(V_A)^2 + \frac{1}{2}I\omega^2$ ☐
d) $\frac{1}{2}(I + mR^2)\omega^2$ ☐



Q3…. to Q.10

Mathematics

Q11) The matrix *U* has eigenvalue λ. If the identity matrix is denoted by I and *h* is a scalar, the eigenvalue of the matrix $(U + Ih)^{-1}(U - Ih)$ is given by,

(a) $\frac{\lambda - h}{\lambda + h}$
(b) $\frac{\lambda + h}{\lambda - h}$
(c) $\lambda^2 - h^2$
(d) λh

Q12) Consider a general $n \times n$ matrix *U*. Suppose the dimension of the null space is denoted by α.

(a) $rank(U) = n - \alpha$
(b) $rank(U) = n$
(c) $rank(U) = n + \alpha$
(d) None of the above

Q13… to Q.20

FLUID MECHANICS

Q21). A fluid flows steadily in a circular pipe of radius a and has a velocity **V** that is parallel to the pipe axis (z axis) that is a maximum U at the center and zero at the pipe wall given by
V = U $(1 - r^2/a^2)$ **k**, where r is the radial distance from the pipe. The flow rate Q in the pipe is given by
a)$(U\pi\ a^2)/2$ b) $(U\pi\ a^2)/4$ c) $(U\pi\ a^2)$ d) $(Ua^2)/2$

Q22) A low speed jet of water is being released from a hose in atmosphere where the pressure is P_{atm}. In the jet flow of water outside the hose the pressure is
a) less than P_{atm} everywhere
b) equal to P_{atm} everywhere
c) less than P_{atm} near the centre and more than P_{atm} at the edge
d) depends on the speed of the flow at the jet outlet

Q.23 … to Q.30