Symbol Number: _____ Invigilator's Sign: _____ Superintendent's Sign: _____

Symbol No. in Words: _____ Code No. | |

School: SOE	Level: BE	Program: BCE	Exam Year: 2080, Push
Subject: Engineering Mechanics II (EG502CE)			Year/Part: II/I (Model Question)
GROUP A (Multiple-Choice Questions)			[10x1=10]

i. Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.
ii. Rough can be done in the main answer sheet
iii. Maximum time of 20 minutes within the total time is given for this group.

Code No. | |

1. One foot =…… m
   a. 0.3048
   b. 0.3028
   c. 0.3058
   d. 0.3038
2. The motion of the particle is defined by the relation $x = t^2-10t+30$, where x is expressed in meter and t in seconds. Total distance travelled in 10 sec is
   a. 34m
   b. 50m
   c. 40m
   d. 45m
3. The normal component of acceleration for a particle moving in a circle is
   a. v^2/r
   b. dv/dt
   c. v^3/r^2
   d. $r\theta$
4. Velocity at which the body escapes the elliptical orbit of planet and flies off the gravity of planet is given by
   a. $\sqrt{\frac{3GM}{R}}$
   b. $\sqrt{\frac{4GM}{R}}$
   c. $\sqrt{\frac{GM}{R}}$
   d. $\sqrt{\frac{2GM}{R}}$
5. Formula for angular momentum is given by
   a. mvr
   b. mvt
   c. mxt
   d. m^2t
6. If v_1, v_2 is the initial and final velocity of the body before and after impulse, the impulse momentum equation is
   a. $mv_1+impulse=mv_2$
   b. $mv_2+impulse=mv_1$
   c. $mv_1-impulse\ x\ time^2=mv_2$
   d. $mv_2-impulse\ x\ time^2=mv_1$
7. Formula for the distance travelled by the body in uniform motion is given by
   a. vt
   b. v^2t
   c. v/t
   d. v^2/t
8. Magnitude of Coriolis acceleration is given by
   a. Ωr
   b. $\Omega^2 r$
   c. Ωu
   d. $2\Omega u$
9. A ball tied in a rope is spinning with constant angular velocity Ω, with a constant radius "r" the tangential acceleration experienced by ball is
   a. 0
   b. $\Omega^2 r$
   c. $4\Omega u$
   d. $2\Omega u$
10. Coefficient of restitution is defined as
    a. Relative velocity after collision/relative velocity before collision
    b. Relative velocity before collision/relative velocity after collision
    c. Absolute velocity after collision/absolute velocity before collision
    d. Absolute velocity before collision/absolute velocity before collision

Multiple Choice Questions' Answer Sheet

Marks Secured: _____

In Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

In Words: _____

Scrutinizer's Sign: _____ Date: _____

Corrected Fill: Ⓐ ● Ⓒ Ⓓ

Incorrected Fill: Ⓐ Ⓑ ● Ⓓ

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

MANMOHAN TECHNICAL UNIVERSITY
Office of the Controller of Examinations
Exam Year: 2080, Push

School: SOE	**Level: BE**	**Program: BCE**	**Time: 3 Hours**
Year/Part: II/I (Model Question)			**Full Marks: 50**
Subject: Engineering Mechanics II (EG502CE)			**Pass Marks: 20**

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary*.

GROUP A ***(Multiple-Choice Questions and Answer Sheet in separate paper)*** **[10x1=10]**

GROUP B ***(Short Answer Questions - Attempt Any Eight)*** **[2x8=16]**

1. Derive expression for velocity and displacement of a body with uniform acceleration in a rectilinear motion.
2. The motion of a particles is defined by the position vector where r in meter and t in second. At the instant when t = 3 sec, find the unit position vector, velocity and acceleration. $\vec{r} = 6t\hat{i} + 4t^2\hat{j} + \frac{t^3}{4}\hat{k}$
3. Prove the law the conservation of angular momentum.
4. In figure-1, a 10 kg collar slides without friction along a vertical rod. The spring attached to the collar has an undeformed length of 100 mm and a constant of 500 N/m. If the collar is released from rest in position 1, determine its velocity after it has moved 150mm to position 2.

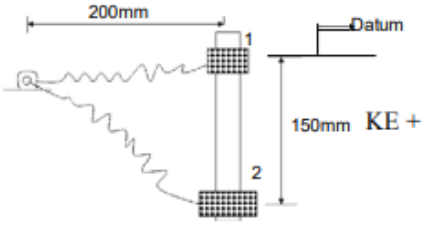

Figure-1

5. The double gear shown in figure-2, rolls on the stationary lower rack, the velocity of its center A is 1.2 m/s, directed to the right. Determine
   a. Angular velocity of the gear
   b. Velocity of the upper rack 'R' and of the point 'D'

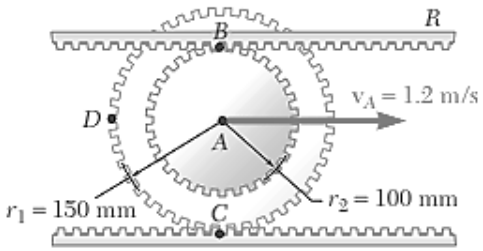

Figure-2

6. Derive an expression for kinetic energy due to rotation and translation occurring simultaneously in a Body.
7. What is a Coriolis acceleration? Derive an expression for the same.
8. What is Instantaneous center of rotation. Write various method of locating center of rotation.
9. The plane curvilinear motion of the particle is defined in polar co-ordinates by r=t3/4+3t and θ =0.5t2 where r is in m, θ is in radian and t is in second. At the instant when t=4 sec, determine the magnitude of velocity and acceleration of the particle.

GROUP C *(Long Answer Questions - Attempt Any Six)*

10. Derive expression for normal and tangential component of a body moving in a curvilinear path of a uniform radius 'r'. [4]
11. A ball is thrown vertically upward from the 12-m level in an elevator shaft with an initial velocity of 18 m/s. At the same instant an open-platform elevator passes the 5-m level, moving upward with a constant velocity of 2 m/s. Determine
    a. when and where the ball will hit the elevator,
    b. the relative velocity of the ball with respect to the elevator when the ball hits the elevator. [2+2]
12. A boy is spinning a ball tied in a string of radius 1m, with a uniform angular velocity of 60 rpm (revolution per minute). The string suddenly got broke and the ball went away shooting in the air making 30° with the linear ground surface. Find the following:
    a. The total horizontal distance travelled by the ball
    b. Max vertical height achieved by ball [2+2]
13. A satellite is launched in a direction parallel to the earth surface with a velocity of 36900 km/h from an altitude of 500km. Determine
    a. Maximum altitude reached by the satellite
    b. the periodic time of the satellite (Assume earth radius as 6370km) [2+2]
14. The magnitude and direction of the velocity of two identical frictionless balls before they strike each other are as shown. Assuming e=0.9, determine the magnitude and direction of the velocity of each ball after the impact. [4]

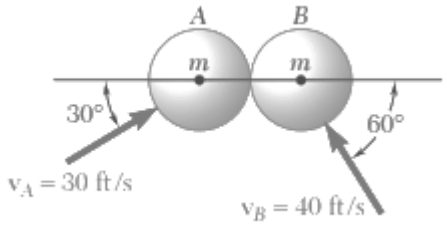

Figure-3

15. A nozzle discharges a stream of water of cross-sectional area A with a velocity V_a. The stream is deflected by single blade that moves to the right with constant velocity V. Assume the water moves along the blade at constant speed, determine
    a. component of force F exerted by blade on the stream
    b. Velocity V of the turbine for which maximum power is developed [2+2]
16. In the engine system shown, the crank AB has a constant clockwise angular velocity of 2000rpm. For the crank position indicated, determine:
    a. the angular velocity of the connecting rod BD
    b. the velocity of position P… [2+2]

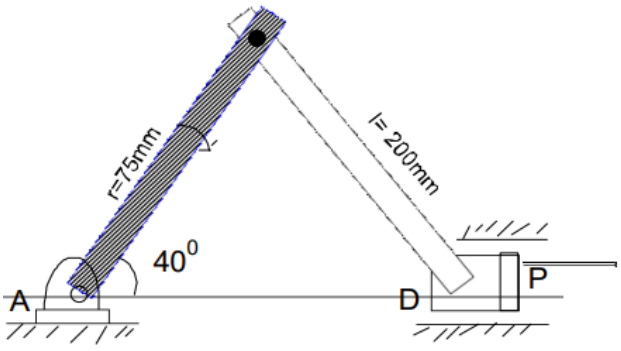

Figure-4

∞∞ ***The End*** ∞∞