KATHMANDU UNIVERSITY
End Semester Examination [C]
April, 2022

Marks scored:

Level : B. E.
Year : II

Course : MEEG 216
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date :

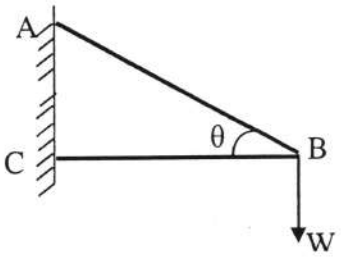
SECTION "A"
[20Q. × 1= 20 marks]

Indicate your answer with an 'X' in the appropriate box.

1. A force which combines with two or more forces to produce equilibrium is called
[ ] Resultant [ ] Equilibrant [ ] Couple [ ] Moment

2. Three forces acting on a rigid body are representing in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to the couple whose moment is equal to
[ ] area of the triangle [ ] half the area of the triangle
[ ] twice the area of the triangle [ ] three times the area of triangle

3. The force induced in the string BC due to the load W as shown in the figure is
[ ] W sin θ [ ] W cos θ
[ ] W tan θ [ ] W cot θ



4. A right circular cone of 20 cm height weighs 1000 N. A cone of 8 cm height and 64 N weights is removed from the top. The distance of CG of the frustum from the base is approximately.
[ ] 2.5 cm [ ] 3.25 cm [ ] 4.25 cm [ ] 6 cm

5. When a body of mass moment of inertia I (about a given axis) is rotated about that axis with an angular velocity ω, then the kinetic energy of rotation is
[ ] $I\omega$ [ ] $I\omega^2$ [ ] $0.5\, I\omega$ [ ] $0.5\, I\omega^2$

6. A block resting on an inclined plane begins to slide down the plane when the angle of inclination is gradually increased to 30°, then the coefficient of friction between the block and plane is closest to
[ ] 0.50 [ ] 0.58 [ ] 0.72 [ ] 0.87

7. The coefficient of friction between two surfaces is a constant of proportionality between the applied tangential force and the normal reaction
[ ] at the instant of the application of force
[ ] at any instant when the body is at rest
[ ] at the instant of impending motion
[ ] at an instant after motion takes place

8. If the gravitational acceleration at any place if doubled, then the weight of a body will be
[ ] g/2 [ ] g [ ] g/4 [ ] 2g

9. Three forces acting on a rigid body are represented in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to a couple whose moment is equal to

[ ] Area of the triangle
[ ] Twice the angle of the triangle
[ ] Half the angle of triangle
[ ] One third the angle of triangle

10. When two bodies move uniformly towards each other, the distance between them decreases by 6 m/sec. If both bodies move in the same direction, the distance between them increases by 5 m/sec. then the speeds of two bodies are

[ ] 3 m/s and 3 m/s [ ] 4 m/s and 2 m/s [ ] 5 m/s and 1 m/s [ ] 8 m/s and 5 m/s

11. A sphere P impinges directly onto another identical sphere Q at rest. If the coefficient of restitution is 0.5, the ratio of velocities V_q/V_p after impact would be

[ ] 1:1 [ ] 2:1 [ ] 3:1 [ ] 2:3

12. A stone tied to the end of a string 100 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 15 revolutions in 30 seconds, the acceleration of the stone is closest to

[ ] 315 cm/s^2 [ ] 630 cm/s^2 [ ] 985 cm/s^2 [ ] 3950 cm/s^2

13. A body is allowed to fall from the top of a tower. It falls through half the height in 2 seconds. The total time taken to reach the ground is nearly

[ ] 4.5 sec [ ] 4 sec [ ] 3.2 sec [ ] 2.8 sec

14. A car moving with uniform acceleration covers 450 m in a 5 seconds interval, and covers 700 m in the next 5 second interval. The acceleration of the car is

[ ] 7 m/s^2 [ ] 10 m/s^2 [ ] 25 m/s^2 [ ] 50 m/s^2

15. Two cars are 10 km apart and moving in the same direction at speed of 40 km/hr. A car moving in opposite direction meets these cars at interval of 8 minutes. At what speed the other car is moving

[ ] 75 km/hr [ ]60 km/hr [ ] 45 km/hr [ ] 35 km/hr

16. When a bullet is fired from a gun, it is recoiled in the backward direction. It is due to

[ ] Conservation of momentum
[ ] Conservation of energy
[ ] Impulse
[ ] Inertia

17. For a particle moving in a circular orbit of radius 0.4 m, the angular velocity and angular acceleration at a particular instant are 2 rad/s and 5 rad/s^2. The particle then has a total linear acceleration of

[ ] 1.9 m.s^2 [ ] 2.69 m/s^2 [ ] 3.8 m/s^2 [ ] 7.24 m/s^2

18. A bullet of mass 0.04 kg moving with a speed of 90 m/sec enters a heavy wooden block and is stopped after a distance of 60 cm. the average resistive force exerted by the block on the bullet is

[ ] 180 N [ ] 220 N [ ] 270 N [ ] 320 N

19. The ratio of static friction to dynamic friction is always

[ ] equal to one [ ] less than one [ ] greater than one [ ] zero

20. A stone falls from the top of a building 200 m high and at the same time another is projected vertically upwards with a velocity of 50 m/sec, then the two will meet

[ ] after 1 sec [ ] after 2 sec [ ] after 4 sec [ ] after 5 sec

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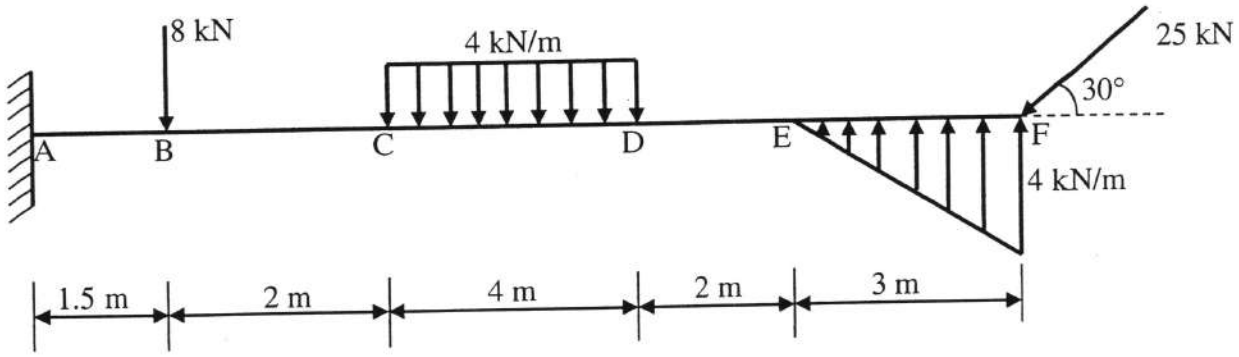
Level : B. E.
Year : II
Time : 2 hrs. 30 mins.

Course : MEEG 216
Semester : I
F. M. : 55

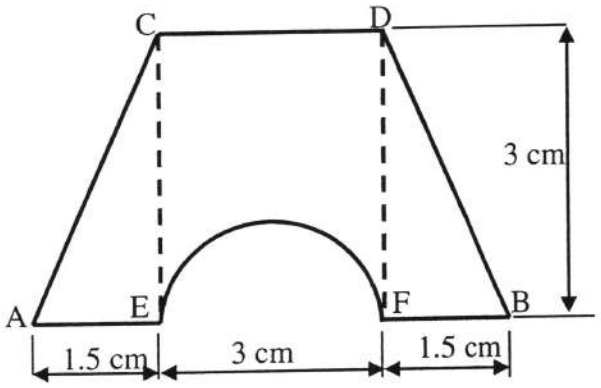
SECTION "B"
[55 marks]

Attempt *ALL* questions. Assume any missing data with proper reasoning

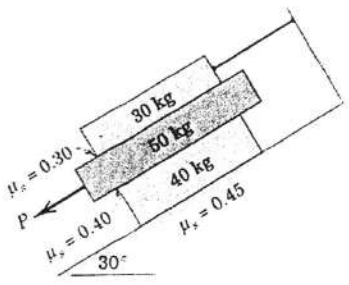
1. A cantilever beam has been loaded as shown in the figure below. Determine the reaction at support if 30 kNm moment is applied at the point E. Reduce the force couple system to a single force equivalent to the given force system. [7]



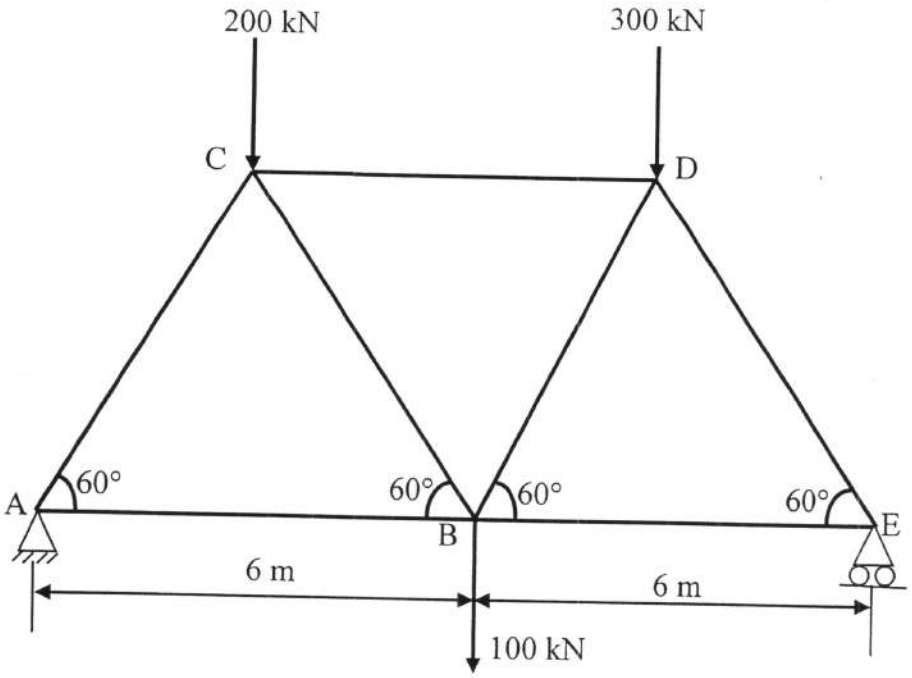
2. Determine the moment of inertia of the plane area shown in the figure below about its centrodial axis. Also find the moment of inertia about the axis parallel to the centrodial axis and passing through the point at a distance of 1.5 cm from the base of the plane area. [7]



3. The three flat blocks are positioned on the 30° incline as shown, and a force P parallel to the incline is applied to the middle block. The upper block is prevented from moving by a wire which attaches it to the fixed support. The coefficient of static friction for each of the three pairs of mating surfaces is shown. Determine the maximum value which P may have before any slipping takes place. [7]



4. A loaded truss is shown in the figure below. Determine the forces in each member of the truss by the method of joints. Also verify your result for any three members by the method of sections. [8]



5. A rubber ball is dropped from a height of 5 m upon a marble floor. Find the height to which the ball rebounds in first, second and third rebounces. Take constant of restitution is 0.95. [5]

6. A body slides along an inclined plan 100 m. The gradient of the plane is 1 in 5 and frictional coefficient of the plane is 0.1. Find out the distance travelled by the body on the horizontal plane form the foot of the inclined plane. [6]

7. A bullet is fired upwards at an angle of 30° to the horizontal from a point on a hill and it strikes the target which is 80 m lower than horizontal through the firing point. If the initial velocity of the bullet is 100 m/s, make calculations for [7]
   a. time to reach the maximum height and its velocity,
   b. the maximum height to which the bullet will rise,
   c. the actual velocity with which it strikes the target,
   d. the total time required for the flight of the bullet, and
   e. the horizontal distance between hill position and the target. Neglect the air resistance.

8. A player strikes a 115 gm tennis ball with his racket when the ball is at the uppermost position i.e. the ball approaches to racket horizontally. The horizontal velocity of the ball just before impact with the racket is 50 m/sec and just after impact its velocity is 70 m/sec directed 15° with the horizontal. Draw the impulse momentum diagram and write the impulse momentum equations. If the ball is in contact with the racket for 0.02 sec, determine the magnitude of the average force exerted by the racket on the ball. Also determine the angle made by the average force with the horizontal. [8]

KATHMANDU UNIVERSITY
School of Science / School of Engineering
End-Semester Examinations
May/June, 2022

Examination Time: 11:00 A.M. to 2.00 P.M.

Date/ Day	I–I	I-II	II – II	III – II
May 26, 2022 Thursday	PHYS 104	PHYS 102 PHYS 105 ARCH 112		ETEG 303 ETEG 301 MEEG 306 COMP 302 GEOM 306 CIEG 308 ARCH 319 INAN 301 MGTS 302 BIOT 305 ENVS 303 MATH 327
May 27, 2022 Friday			MATH 208 MATH 207 ENVS 203 PHAR 214 MATH 217 ARCH 215 BIOT 206 BIOT 208	
May 30, 2022 Monday	CHEM 101	MATH 104 MATH 102 MATH 103 MATH 106		EEEG 309 MEEG 308 COMP 314 GEOM 310 CIEG 309 CIEG 341 CHEG 305 ENVS 335 PHAR 311 BIOT 306
May 31, 2022 Tuesday			MCSC 202 ESEE 221 ARCH 216 PHAR 223 BIOT 207	Semi Lithograph
June 2, 2022 Thursday	COMP 101 AGRS-116	ENVE 101 CHEM 102 BIOT 102 NEPT 101		GEOM 307 CHEG 314 PHAR 313

SOCA-401

ENVS-402

ARCH-425

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Date/ Day	I–I	I-II	II – II	III – II
June 5, 20222 Sunday		AGRN -111	EEEG 214 MEEG 202 COMP 204 CIEG 206 CIEG 241 CHEG 210 ENVS 202 CHEM 212	
June 6, 2022 Monday	MATH 111	COMP 116 COMP 117 ARCH 161		ETEG 305 COEG 301 MEEG 318 COMP 304 MATH 322 GEOM 315 CIEG 310 CHEG 310 CIEG 342 ENVS 336 BIOT 307
June 7, 2022 Tuesday		AGRS-105 COMP 102		PHAR 316
June 8, 2022 Wednesday			PHAR 221 BIOL 207	
June 9, 2022 Thursday		ENVS 101	EEEG 215 MEEG 206 COMP 231 GEOM 204 CIEG 207 CIEG 242 CHEG 211 BIOT 211 MATH 211	
June 10, 2022 Friday	ENGT 104	ENGT 105 CHEM 103 ARGS-117		ETEG 321 EPEG 318 MEEG 317 MEEG 309 COMP 341 GEOM 319 CIEG 318 CIEG 313 CHEG 312 EEEG 331 BIOT 308 ENVS 305 ENVS 345 MATH 325

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Controller of Examinations

Date/ Day	I–I	I-II	II – II	III – II
June 12, 2022 Sunday		ENVS 112 Agret · 111	PHAR 224 ENVS 205	PHAR 315
June 13, 2022 Monday	PHAR 112		EEEG 221 MEEG 207 COMP 232 GEOM 206 CIEG 208 CHEG 212 BIOT 210 PHAR 212	GEOM 313
June 14, 2022 Tuesday		BIOT 101		EPEG 301 EPEG 315 MGTS 303 COMP 306 COMP 323 CIEG 312 CHEG 313 BIOT 309 ENVS 337 ENVE 399
June 15, 2022 Wednesday		ENGG 112	PHAR 222 ESEE 201	
June 16, 2022 Thursday				ENVS 306
June 17, 2022 Friday			CEEG 201 CIEG 209 CHEG 213 ENVE 205 MATH 213	
June 19, 2022 Sunday				COMP 307 COMP 342 COMP 409 CIEG 314 CHEG 315 CHEG 322 ENVS 331 ENVE 311

Note:

1. *Examinations will be conducted as per this schedule and under no circumstance the dates and times will be changed unless the University publishes prior notice.*
2. *Practical examinations will be conducted by the schools/ departments.*
3. *The schools/departments should submit the in-semester evaluations and the practical examination evaluations to the Office of the Controller of Examinations by May 19, 2022.*

Controller of Examinations