

FACULTY OF ENGINEERING
B.E. (Bridge Course) II Semester (Backlog) Examination, March / April 2022

Subject: Engineering Mechanics

Time: 3 Hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

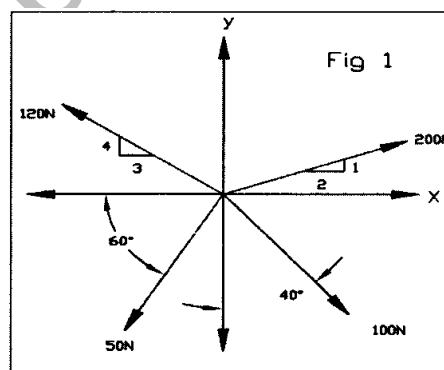
- 1 Define Force and its characteristics with an example.
- 2 State and explain triangular law of force system.
- 3 Write down the vrignon's theorem for non concurrent force system.
- 4 What are the uses of wedge, jack?
- 5 Differentiate between mass moment of inertia and radius of gyration.
- 6 State pappu's theorem.
- 7 When velocity is constant, the acceleration is?
- 8 A railway truck of mass 16000 kg moving with a velocity 5m/s. strikes another truck of mass 4000 kg at rest. If they move together after impact what will be their common velocity.
- 9 Define principle of work energy.
- 10 If a particle in SHM has an amplitude of 0.3m and period of 1sec then displacement of particle after 0.4sec when the particle is at the right end of its path.

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 Determine the resultant and inclination with respect to horizontal axis of given forces system as shown in Fig.1



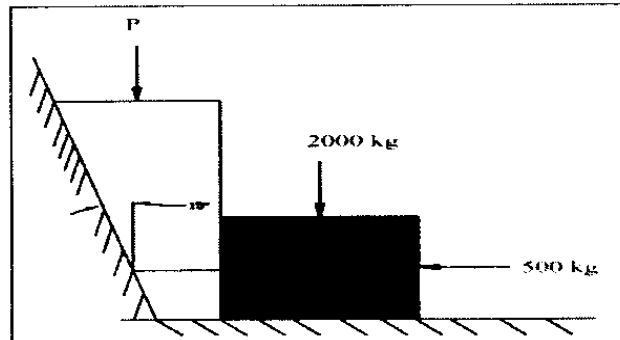
file 1

- 12 A beam AB of span 10M is loaded with UDL which varies from zero at one end to 1000Kn at other end, according to relation $y = x^2$. Determine reaction at A and B.

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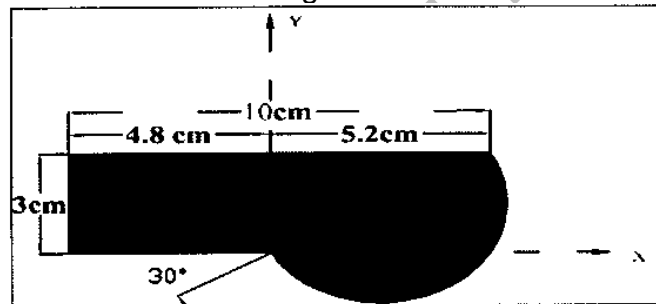
- 13 Determine the force P required to start the wedge shown in figure 2 the angle of friction for all surfaces in contact is 15° .

Figure 2.



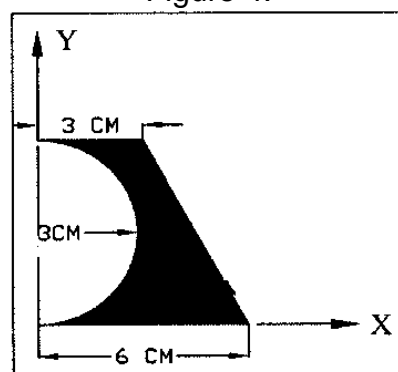
- 14 Determine the centroid of the shaded area shown in figure 3 with respect to the given X-Y axes.

Figure 3.



- 15 Find the product of inertia of the shaded area in figure 4 about the specified X and Y axes.

Figure 4.

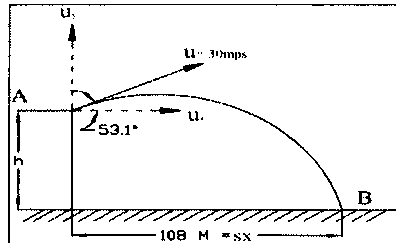


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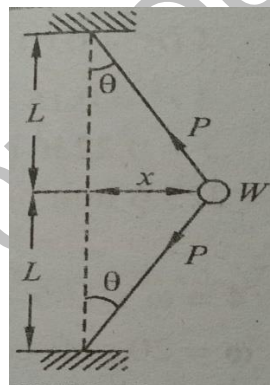
- 16 A golf ball is hit from an elevated tee to a green the distance horizontally is 108 mt as shown in figure 5. If the initial velocity of the ball is 30mps.at 53.1° to the horizontal how high is the tee above the green? Say tee is h mt above the green.

Figure 5.



- 17 An elastic string of length $2L$ tightly stretched between two rigid supports as in figure 6 carries a small ball of weight ' W ' at its midpoint. Show that for small displacements, the ball will have a SHM. Compute the time period.

Figure 6.



FACULTY OF ENGINEERING
B.E. I –Year (CBCS) (Backlog) Examination, March / April 2022
(Common to all Branches)
Subject: Engineering Mathematics - I

Time: 3 Hours

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

PART – A**Note: Answer all questions.****(10 x 2 = 20 Marks)**

1. Find the sum and product of the eigenvalues of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 1 & 3 \end{bmatrix}$.
2. State Cayley-Hamilton theorem.
3. Examine the convergence of the series $\sum \left(\frac{n^2 + 1}{n^2} \right)$.
4. Define absolute convergence and conditional convergence of a series.
5. Find the radius of curvature of the curve $y = x^2$ at (1,1).
6. Find horizontal and vertical asymptotes of the curve $y = x + \frac{1}{x}$.
7. Find the first order partial derivatives of $f(x, y) = ye^{-x}$.
8. Obtain the minimum value of $f(x, y) = 4x^2 + 9y^2 + 8x - 12y + 4$.
9. Show that $\vec{v} = (x + 3y)\hat{i} + (y - 3z)\hat{j} + (x - 2z)\hat{k}$ is solenoidal.
10. State Gauss divergence theorem.

PART – B**Note: Answer any five questions.****(5 x 10 = 50 Marks)**

11. (a) Find the value of k such that the system of equations
 $2x + y + 2z = 0$, $x + y + 3z = 0$, $4x + 3y + kz = 0$ has (i) trivial solution and
(ii) non-trivial solutions.
(b) Find the canonical form, nature and index of the quadratic form
 $Q = 2(x_1 x_2 + x_2 x_3 + x_3 x_1)$.
12. (a) Discuss the convergence of the series $\sum (\sqrt{n^4 + 1} - \sqrt{n^4 - 1})$.
(b) Test for convergence of the series $1 + a + \frac{a(a+1)}{1.2} + \frac{a(a+1)(a+2)}{1.2.3} + \dots$.
13. (a) State and prove Lagrange's mean value theorem.
(b) Find the Taylor series expansion of $f(x) = \sin x$ about $x = \frac{\pi}{4}$.
14. (a) Find $\frac{df}{dt}$ at $t = 0$, if $f(x, y) = x \cos y + e^x \sin y$, $x = t^2 + 1$, $y = t^3 + t$.
(b) If $u = x - y + z$, $v = x + y - z$, $w = -x + y + z$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ and $\frac{\partial(x, y, z)}{\partial(u, v, w)}$.

-2-

15. Verify Green's theorem for $\oint_C (xy + y^2) dx + x^2 dy$ where C is the closed curve of

the region bounded by $y = x$ and $y = x^2$.

16. Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$.

17.(a) Verify Rolle's theorem for $f(x) = x^2 - 2x$ in $[-1, 3]$.

(b) Find the directional derivative of $f(x, y, z) = xy + yz + zx$ in the direction of the vector $\hat{i} + 2\hat{j} + 2\hat{k}$ at $(1, 2, 0)$.

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FACULTY OF ENGINEERING
B.E. I - Year (NON-CBCS) (Backlog) Examination, March / April 2022
(Common to all Branches)
Subject: Programming in C & C++

Time: 3 Hours

Max. Marks: 75

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions.

(25 Marks)

- 1 List and explain logical operators.
- 2 Draw block diagram of a computer.
- 3 What are multidimensional arrays?
- 4 What is #include directive?
- 5 What is self referential structure?
- 6 Differentiate between C and C++ programming.
- 7 What are access specifiers?
- 8 What is inline function?
- 9 What are static data members?
- 10 What are default arguments?

PART – B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- 11 (a) What are components of a computers? Explain functions of each component.
(b) Discuss various symbols used in flow charts.
- 12 Explain selection control structure with examples.
- 13 (a) Write a program for implementing binary search.
(b) Explain call by value technique with example.
- 14 (a) What are different operations which can be performed on pointers?
(b) Write a program using structures for reading and printing employee records containing name, employee id, department and salary.
- 15 (a) Write a program for copying contents of one file to other.
(b) Write a program to overload binary operator.
- 16 Explain in detail the concept of exception handling with an example program.
- 17 Write short notes on the following:
 - (a) Virtual functions
 - (b) Class templates
 - (c) Default arguments