2022
GOUR MAHAVIDYALAYA
DEPARTMENT OF MATHEMATICS
Paper : MTMH - DC-08
[CBCS]
The figures in the margin indicate full marks.
Notations and symbols have their usual meanings.

Group- A

[Full marks: 15]

1. Answer any one question: [1×4=4]

(a) Solve $\left(xy^2 - e^{1/x^3}\right) dx - x^2y \, dy = 0$. [4]

(b) Solve $\frac{dx}{dy} = x^2y^3 + 2xy$. [4]

2. Find the differential equation of the confocal conics $\frac{x^2}{a^2+\lambda} + \frac{y^2}{b^2+\lambda} = 1$, where a, b are fixed constants and λ is an arbitrary parameter. [3]

Group- B

3. Answer any one question: [1×3=3]

(a) Eliminate the arbitrary constants a, b and obtain the p.d.e from the equation $z = (x + a)(y + b)$. [3]

(b) Find the differential equation of the set of all right circular cones whose axes coincide with z-axis. [3]

4. Answer any one question: [1×5=5]

(a) Solve $\cos(x + y)p + \sin(x + y)q = z$. [5]

(b) Find the equation of the integral surface of the P.D.E. $2y(z - 3)p + (2x - z)q = y(2x - 3)$, which passes through the circle $z = 0, x^2 - 2x + y^2 = 0$. [5]

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2022
Gour Mahavidyalaya
MATHEMATICS (Honours)
Paper Code: MATH-H-DC 09
Mechanics
[CBCS]

Full Marks : 15   Time : 1 hr

The figures in the margin indicate full marks.
Notations and symbols have their usual meanings.

1. (a) What do you mean by resultant force?
   The resultant of two forces P and Q is of magnitude P. Show that, if P be doubled, the
   new resultant is at right angles to Q and its magnitude will be $\sqrt{4P^2 - Q^2}$.   [5]

   or

   (b) What do you mean by coplanar forces?
   The greatest and least magnitudes of the resultant of two forces of constant magni-
   tudes are R and S respectively. Prove that, when the forces act at an angle 2ϕ , the
   resultant is of magnitude $\sqrt{R^2 cos^2\phi + S^2 sin^2\phi}$.   [5]

2. (a) What is couple and moments of a couple?   [2]

   (b) Show that, any force F acting at a point A of a rigid body can be replaced by an equal
   and parallel force F acting at an arbitrary choosen point O of the body together with a
   couple whose moment is equal to the moment of the given force F about the choosen
   point O.   [3]

3. (a) (i) Show that, if a system is not in equilibrium then it can be reduced either to a
            single force or to a single couple.   [2]

        (ii) M_1, M_2, M_3 are the moments of a system of forces acting in the xy plane, about
             three non-collinear points $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ respectively. If the resultant of
             the system is a single force at the origin , Show that
             $M_1(x_2 y_3 - x_3 y_2) + M_2(x_3 y_1 - x_1 y_3) + M_3(x_1 y_2 - x_2 y_1) = 0.$ [3]

   or

   (b) If a system of coplanar forces acting at different points of a rigid body. Write down
   the changes in the resultant when each force be turned in the plane of forces about
   its point of application through the same angle in the same sense. Also discuss about
   equilibrium of the new system if the old system is in equilibrium.   [5]

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GOUR MAHAVIDYALAYA

MATHEMATICS(Hons)

4th Semester Hons Class Test Exam(1st)

Paper Code-DC-10

Time-One Hour

F.M.-20

1. Answer all the questions.

5

(a) Define Simple and Compound Event.

[2]

(b) A coin is tossed and a die is thrown simultaneously. Write down the sample space.

[1]

(c) What is random variable?

[2]

2. Answer any three questions.

5×3=15

(a) If m things are distributed among a men and b women, show that the chance that the things received by men is odd is
$\frac{1}{2}\frac{(b+a)^m-(b-a)^m}{(b+a)^m}$.   [5]

(b) A man speaks 80% truth and another 90%. While stating the same fact, what is the probability that they (i) contradict, (ii) agree? [5]

(c) A random variable takes the values -3,-2, -1, 0, 1, 2, 3 such that

$P(X=0) = P(X>0) = P(X<0)$;

$P(X=-3) = P(X=-2) = P(X=-1)$;

$P(X=1) = P(X=2) = P(X=3)$.

Obtain the probability distribution and distribution function of X.   [5]

(d) n letter to each of which corresponds an envelope, are placed in the envelopes at random. What is the probability that exactly r letters are placed in the right envelopes? [5]

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