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M.A./M.Sc. (Final) Examination, 2020

MATHEMATICS

Paper - II

(Partial Equations, Mechanics & Gravitation)

Time Allowed : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 36

Note : Attempt any five questions. All questions carry equal marks.

Q. 1. Obtain the solution of the wave equation

$$\frac{\partial^2 u}{\partial t^2} = h^2 \frac{\partial^2 u}{\partial x^2}$$
 if the string is originally plucked at

the middle point by giving it an initial displacement d from the mean position.

Q. 2. Determine the solution of one dimensional heat equation :

$$\frac{\partial \theta}{\partial t} = h^2 \frac{\partial^2 \theta}{\partial x^2}$$

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P.T.O.

(2)

under the boundary conditions

$\theta(0, t) = \theta(\ell, t) = 0, t > 0$ and the initial condition

$$\theta(x, 0) = x, 0 < x < \ell$$

ℓ being the length of the bar.

Q. 3. Generalize Potential Lagrange's equations of first

kind.

Q. 4. State and prove the Jacobi-Poisson theorem.

Q. 5. Derive two dimensional wave equation.

Q. 6. Explain the following :

(i) Green's function

(ii) Harmonic functions

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Q. 7. State and prove the Cauchy-Kovalevskaya theorem.

Q. 8. Find the Attraction and Potential of a solid sphere at an external point.

Q. 9. To determine the potential of a finite rod AB at an external point P.

Q. 10. Explain the following :

(i) Hopf-Lax formula

(ii) Legendre transform

