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M.Sc. MATHEMATICS IIIRD SEMESTER EXAMINATION, 2019

Paper - VI

Viscous Fluid Dynamics -I

Time: Three Hours

Maximum Marks: 80

PART – A (खण्ड – अ) *[Marks: 20]*

Answer all questions (50 words each).

All questions carry equal marks.

सभी प्रश्न अनिवार्य हैं। प्रत्येक प्रश्न का उत्तर 50 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART – B (खण्ड – ब) *[Marks: 40]*

Answer five questions (250 words each).

Selecting one from each unit. All questions carry equal marks.

*प्रत्येक इकाई से **एक–एक** प्रश्न चुनते हुए, कुल पाँच प्रश्न कीजिए।*

प्रत्येक प्रश्न का उत्तर 250 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART – C (खण्ड – स) *[Marks: 20]*

Answer any two questions (300 words each).

All questions carry equal marks.

*कोई **दो प्रश्न** कीजिए। प्रत्येक प्रश्न का उत्तर 300 शब्दों से अधिक न हो।*

सभी प्रश्नों के अंक समान हैं।

PART – A

Q.1 (i) Define Viscosity.

(ii) What is the relation between stress and rate of strain?

(iii) Write the Reynolds's Law of similarity.

(iv) What is Prandlt number?

(v) What is the coefficient of skin-friction when flow between parallel plates (velocity distribution)?

(vi) What is the coefficient of skin-friction when flow in circular pipe (velocity distribution)?

(vii) Write the equation of continuity and momentum in Jeffery Hamel flow.

(viii) What is the velocity and pressure in a potential flow in the vicinity of the stagnation point $x = 0$, $y = 0$ in a plane?

(ix) What is the Stokes' layer when flow due to an oscillating plate in a rotating fluid?

(x) Write the Stokes' equations for very slow motion.

PART – B

UNIT –I

Q.2 Generalize the Law of Heat – Conduction.

OR

Define equation of state.

UNIT –II

Q.3 Define vorticity transport equation.

OR

What is the physical importance of Non-Dimensional parameters?

UNIT –III

Q.4 Define velocity distribution when flow between two concentric rotating cylinders (Couette flow).

OR

Discuss plane couette flow of velocity distribution when flow between parallel plates.

UNIT –IV

Q.5 Discuss the flow in divergent channel.

OR

Discuss the Rotationally symmetrical flow with stagnation point (Homann flow).

UNIT –V

Q.6 Discuss Stokes' flow past a circular cylinder (Stokes' paradox).

OR

Define Oseen's equation of very slow motion.

PART – C

Q.7 Discuss equation of continuity (conservation of mass).

Q.8 Discuss the fundamental equations of a viscous compressible fluid in ordinary cartisian coordinates.

Q.9 Discuss the flow in tube of circular cross – section.

Q.10 Discuss the flow in a convergent channel.

Q.11 Discuss the Oseen's flow past a circular cylinder.
