2024-28

Full Marks : 75

Time : 3 Hours

Candidates are required to give their answer in their own words as far as practicable. Their figures in the margin indicate full marks.

Answer from both the Sections as directed.

Section – A
(Compulsory)

1. Answer **all** questions : 1×5=5

(i) Divergence of a solenoidal vector is equal to ..... .

(ii) What are curvilinear coordinates ?

(iii) Velocity of satellite in circular orbit is given by equation ..... .

(iv) Give statement of Poiseuille's law.

(v) The proper time between two events is measured by clocks at rest in reference frame in which two events occur at ..... .

2. Give geometrical interpretation of Gradient. 5

3. Derive expression for the depression of loaded end of the cantilever. 5

Section – B

Answer any **four** questions : 15×4=60

4. (a) Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$ 8

   (b) Calculate the directional derivative of the function $\phi(x,y,z) = xy^2 + yz^3$ at the point (1, -1, 1) in the direction of (3,1,-1) 7

5. (a) Show that the vector

   $$V = (x+3y)\hat{i} + (y-3z)\hat{j} + (x-2z)\hat{k}$$

   is solenoidal 6

   (b) State Gauss divergence theorem, Green's theorem & stoke's theorem. 9

6. What is Elasticity ? State Hook's law. What is elastic limit ? Briefly explain all four elastic constants.

7. Explain Jager's Method for determination of surface tension with diagram.

8. Reduce two body problem to one body problem and calculate total energy and momentum for equivalent one body problem for two masses.

9. Write postulates of special theory of relativity. Explain Michelson morley experiment & its out come.

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