#### (REVISED COURSE)

QP Code: 11859

(3 Hours)

Total Marks: 80

- N. B.: (1) Question No.1 is compulsory.
  - (2) Attempt any three questions of the remaining five.
    - (3) figures to the right indicate full marks.

1. (a) Evaluate 
$$\int_{0}^{2} x^{4} (8-x^{3})^{-1/3} dx$$

(b) Solve 
$$\frac{d^4y}{d^4} + 2\frac{d^2y}{d^2} + y = 0$$

(c) Prove that 
$$E = 1 + \Delta = e^{4D}$$

(d) Solve 
$$\left[x\sqrt{x^2+y^2}-y\right]dx + \left[y\sqrt{x^2+y^2}-x\right]dy = 0$$
 3

(e) Change to polar coordinates and evaluate 
$$\int \int \frac{x}{\sqrt{x^2 + y^2}} dy dx$$
 4

2. (a) Solve 
$$\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$$

(b) Change the order of integration and evaluate 
$$\int_{-y/2}^{y} \frac{y}{(a-x)\sqrt{ax-y^2}} dxdy$$
 6

(c) Prove that 
$$\int_{a}^{\infty} \cos \lambda x \left(e^{-ax} - e^{-bx}\right) dx = \frac{1}{2} \log \left(\frac{b^2 + \lambda^2}{a^2 + \lambda^2}\right)$$
, a>0, b>0 using DUIS 8 rule

3. (a) Evaluate 
$$\iiint \frac{dx \, dy \, dz}{x^2 + y^2 + z^2}$$
 throughout the volume of the sphere 
$$x^2 + y^2 + z^2 = a^2$$

(c) Apply the method of variation of parameters to solve
$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x} \sec^2 x$$

4. (a) Find the length of one arc of the cycloid 
$$x = a(\theta - \sin \theta)$$
 and  $y = a(1 + \cos \theta)$ 

(b) Solve 
$$\frac{d^2y}{dx^2} + 2y = x^2e^{3x} + e^x \cos x$$

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