209 + 6 = 215

SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | |

Total no of pages:[02]
Total number of questions:06

B.Tech. || All Streams|| 1st Sem

Engineering Mathematics I

Subject Code: BTAM-101A (Reappear) / (BTAM 101)

Paper ID: M/18 (for office use)
(2011 batch onwards)

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**

PART A (2×10) all COs

Q1 Short-Answer Questions:

(a) If u = x^y, then find $\frac{\partial^2 u}{\partial x \partial y}$.

(b) Define vector differentiation.

(c) State Gauss Divergence theorem.

(d) Verify Euler theorem for u = xy + yz + zx.

(e) What error in the common logarithm of a number will be produced by an error of 1% in the number?

(f) State Taylor's series for a function of two variables.

(g) Define Moment of Inertia.

(h) Evaluate by changing the order of integration $\int_0^a \int_y^a xy\,dx\,dy$.

(i) Evaluate $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z \, dx\,dy\,dz$.

(j) If $\vec{F}$ & $\vec{G}$ are irrotational, prove that $\vec{F} \times \vec{G}$ is solenoidal.

PART B (8×5)

2. Trace the curve $y = x^3 + 5x^2 + 3x - 4$. COa

OR

Find the centre of curvature of the parabola $x = at^2, y = 2at$ at the point t and hence find its evolute.

COa

3. Find by double integration, the C.G. of the area of the cardioid $r = a(1 + \cos\phi)$. CO b

OR

Find the area bounded by the parabola $x^2 = 8y$ and the circle $x^2 + y^2 = 9$.

CO b

4. If $V = r^m$ and $x^2 + y^2 + z^2 = r^2$, show that $V_{xx} + V_{yy} + V_{zz} = V''(r) + \frac{2}{r}V'(r)$. COc

OR

Find the extreme values of $x^2y^2 - 5x^2 - 8xy - 5y^2$.

COc

5. Evaluate $\iiint_R \frac{dxdydz}{(x+y+z+1)^3}$ if the region R is bounded by the coordinate planes and the plane. $x + y + z = 1$. CO d

OR

Evaluate $\iint \sqrt{a^2 - x^2 - y^2}\, dxdy$ over the semicircle $x^2 + y^2 = ax$ in the positive quadrant by changing into polar coordinates.

CO d

6. Find the directional derivative of $\Phi = x^2 + y^2 + z^2$ in the direction of the line $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ at $(1,2,3)$. COe

OR

Verify Stoke's theorem for COe

$\int_C (ydx + zdy + xdz)$ where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$.