A COURSE OF MATHEMATICS (PAPER B)

TIME ALLOWED:- 3 HOURS
MAXIMUM MARKS:- 100   ☐ PASS MARKS: 33%

NOTE: Attempt SIX questions in all by selecting three questions from each section.

Section I

Q No. 1(a)   Seprate into real and imaginary parts $\tan^{-1}(x+iy)$.   (8)
(b)   If $\tan(\alpha+i\beta)=x+iy$; show that $x^2+y^2+2x\cot 2\alpha=1$.   (8)
Q No. 2(a)   Find the equation of plane passing through the line of intersection of the planes   (8)
$4x-3y+z-4=0$ and $2x+2y+3z-6=0$ and perpendicular to the plane $6x-2y+3z=8$.
(b)   Derive the equation of a plane in normal form.   (8)
Q No. 3(a)   Find the equation of the sphere which passes through $(2, 1, 3)$, $(3, 2, 1)$ and $(1, 1, 2)$.
(b)   Obtained intercepts and traces of the plane which is at a distance 4 from the origin and   (9)
which has normal components $(1, 2, -2)$.
Q No. 4(a)   Find the equation of the two lines passing through the point $(5, -3, 2)$ and has direction
angles $\alpha=\pi/3$, $\beta=\pi/4$.   (8)
(b)   Show that the lines $x+3y-z+6=0$, $2y+z=3$ and $\frac{x-3}{2}=\frac{y}{4}=\frac{1-z}{3}$ are
perpendicular to each other.   (8)
Q No. 5(a)   Find the equation of the sphere if it passes through the points $(-3, 6, 0)$, $(-2, -5, -1)$, $(1, 4, 2)$
and the center lies on the hypotenuse thus formed.   (9)
(b)   Find the equation of the surface generated by revolution of $x^{\frac{2}{3}}+z^{\frac{2}{3}}=1, y=0$ about
(a)   The x-axis   (b)   The z-axis.   (8)
Q No. 6(a)   Find the pedal equation of the parabola $y^2=4a(x+a)$.   (9)
(b)   Plot the equation $x^2-3xy+y^2+10x-10y+21=0$.   (8)

SECTION II

Q No. 7(a)   Find the area of the surface generated by rotating one arc of the sine curve about its axis.
(b)   Find the volume of a solid by rotating the orgion bounded by the curves $y=x^{\frac{2}{3}}$, $x=a$
and the tangent to $y=x^{\frac{2}{3}}$ at $x=1$ about the y-axis.   (9,8)
Q No. 8(a)   Find the volume of the right circular cone of height 10 and base diameter 20.   (8)
(b)   Prove that every normal to a sphere passes through its center.   (9)
Q No. 9(a)   Find the area bounded by $y=3x, y=x^2, x=1, x=3$.   (8)
(b)   State and prove EULER'S theorem.   (8)
Q No 10(a)   Solve differential equation $x\frac{dy}{dx}+(1+x\cot x)y=x$.   (8)
(b)   Solve differential equation $p=\tan\left(x-\frac{p}{1+p^2}\right)$ (8)
Q No 11(a)   Find the general solution of the differential equation $(D^2+4)y=4(\sin x)^2$.   (8)
(b)   Find the differential equation of all hyperbola in standard form.   (9)
Q No. 12(a)   Find the orthogonal trajectories of the curves $r=a(1+\sin\theta)$.   (8)
(b)   Solve $4xp^2=(3x-1)^2$ and find the singular solution, if any.   (9)

Mathematics Paper 2015 Supplementary

Judd E. Hollander

Mathematics Paper 2015 Supplementary:

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