BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

SEMESTER: ...
SESSION: MO/...

CLASS: BTECH/IMSC
BRANCH: ALL/PHYSICS

SUBJECT: MA103 MATHEMATICS - I

TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Discuss the convergence of the series: $\sum_{n=1}^{\infty}\frac{5^n}{2^n+5}$.	[5]	1	2
Q.1(b)	Test for absolute convergence of the series: $\sum_{n=1}^{\infty}(-1)^{n-1}\frac{n^3}{n+4}$.	[5]	1	2
Q.2(a)	Find the value of λ for which the following system of equations is consistent, $x+y+4z=1;\ x+2y-2z=1;\ \lambda x+y+z=1$.	[5]	2	3
Q.2(b)	Verify Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix}5 & 4\\ 1 & 2\end{bmatrix}$. Hence compute A^{-1}.	[5]	2	3
Q.3(a)	Using Euler's theorem, show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\tan u$, When $u=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$.	[5]	3	3
Q.3(b)	Find the extreme value of the function $f(x,y)=3x^2+4xy+y^2+x^3$.	[5]	3	5
Q.4(a)	Evaluate the double integral $\iint y\,dy\,dx$ over the region $A=\{(x,y): 0\le y\le \sin x,\ 0\le x\le \pi\}$.	[5]	4	5
Q.4(b)	Evaluate the triple integral $\iiint z\,(x^2+y^2)dxdy\,dz$ over the region $V=\{(x,y,z): x^2+y^2\le 1;\ 2\le z\le 3\}$ by using cylindrical coordinates.	[5]	4	5
Q.5(a)	Find a unit vector normal to the surface $x^3+y^3+3xyz=3$ at the point $(1,2,-1)$.	[5]	5	3
Q.5(b)	Using the Green's theorem evaluate line integral $\oint(3x^2-8y^2)dx+(4y-6xy)dy$ along the closed curve, where C is the boundary of the region defined by $y=\sqrt{x}, y=x^2$.	[5]	5	3

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