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Code No. 6002

## FACULTY OF ENGINEERING & INFORMATICS

Dora. 24/3

### B.E. | Year (Common to all Branches) (Suppl.) Examination, December 2013

## Subject: Mathematics — |

### Time: 3 Hours

#### Max.Marks: 75

Note: Answer all questions from Part A. Answer any five questions from Part B.

# PART \_ A (25 Marks)

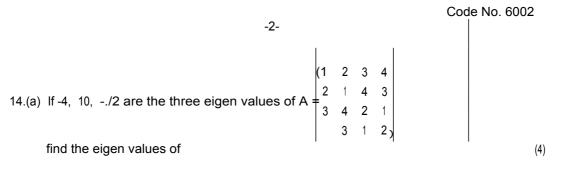
1. Find the Taylor's series expansion of $f(x) = 2^x$ about x=0.	(2)
2. Find the radius of curvature of the curve $r = a sine + b cos@ at e. zr/2$ .	( <sup>3</sup> )
3. Show that $\lim_{(x,Y) \to (0^{0})} \frac{x^2}{x^2} y$ does not exist.	(2)
4. If $z=y+f(u)$ , $u = -\frac{x}{a}$ , show that $u \frac{az}{ax} + \frac{az}{ay} = 1$ .	( <sup>3</sup> )
5. Evaluate $\int_{0.2y}^{1.2} ex^2 dx dy$ by changing the order of integration.	(2)
6. Find a vector that gives the direction of maximum rate of increase for $f(x,y,z)=6xyz$	
at (-1,2,1).	( <sup>3</sup> )
7. Find the values of A and $p$ such that the system of equations $x+y+z = 6$ ,	
$x+2y+3z = 10$ , $x + 2y + Az \neq b$ has an infinite number of solutions.	(2)
B. Show that the vectors (2,2,0), (3,0,2), (2,-2,2) are linearly independent.	( <sup>3</sup> )
9. Discuss the convergence of the series $Z(1 + \frac{1}{n})n \neq 0$ .	(2)
10. Test whether the series $nVn^{(-1)n}$ converges absolutely or not.	( <sup>3</sup> )
PART — B (50 Marks)	
11.(a) State and prove Rolle's theorem.	(6)
(b) Find the envelope of the family of curves x tan a + y sec a = 5, a is a parameter.	(4)
12.(a) Trace the curve $y = x^3 - 12 \times 16$ .	(6)
(b) Examine $f(x,y) = x^4 + 2x^2y - x^2 + 3y^2$ for maximum and minimum values.	(4)
13.(a) Show that V = 12xi $15y^2$ j + k is irrotational and find a scalar function f(x,y,z) such	-
that V = grad f. $II = 1 + 1 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 +$	( <sup>5</sup> )
(b) Use the divergence theorem to evaluate $IJ_F$ ,n ds, where F $4\pi = 2y^2j + z^2k$ and	t
S is the surface bounding the region $x^2+y^2 = 4$ , z=0 and z=3.	( <sup>5</sup> )

...2.



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(b) Find the canonical form, nature, index and signature of the quadratic form

$$Q = 8 x_1^2 + 7 x_2^2 + 3 x_3^2 - 12x1 x_2 - 8x2x_3 + 4x3x_1.$$
 (<sup>6</sup>)

15. Test the convergence of the series

a) 
$$\frac{1}{1.3.5} + \frac{2}{3.5.7} + \frac{3}{5.7.9}$$
 (4)  
b)  $\frac{(r^{11})^2 \times 2n}{(2\pi)^3}$  (6)

16.(a) Find the evolute of the curve  $y^2 = 4ax$ .

(2n)i

show that  $a^{2r}$   $a^{2r}$   $a^{2r}$  at (0,0).

17.(a) Show that  $Vx(V \times V) = V(V. V) - V^2 V$ (2 3 1 0 4 (b) Find the rank of the matrix A = 3 1 2 -1 1 4 -1 3 -2 -2 5 4 3 -1 5, (5)

(5)