Roll No. ....

BCA–205(N)

B. C. A. (Second Semester)
EXAMINATION, May/June, 2015

(New Course)

Paper Fifth

MATHEMATICS–II

Time : Three Hours] [*Maximum Marks : 75*

Note : Attempt questions from all Sections as directed.

Section—A 3 each

(Short Answer Type Questions)

1. (A) Evaluate :

$$\int_0^1 \int_0^2 (x + y)\, dx\, dy$$

(B) Find where the line $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4}$ meets the plane $2x + 4y - z + 1 = 0$.

(C) Discuss the maximum and minimum of :

$$u = x^2 + y^2 + 6x + 12$$

(D) Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ when $z = \log(x^2 + y^2)$.

(E) Draw the Hasse diagram of $(A, \leq)$, where $A = \{3, 4, 12, 24, 48, 72\}$ and relation $\leq$ be such that $a \leq b$ if a divides b.

(F) Find a set of all real numbers x such that $[x] = 2$

(G) Let $A = \{a, b, c\}$, $B = \{2, 4, 6, 10\}$. A relation R from A to B is given as follows ${}_aR_2$, ${}_aR_4$, ${}_aR_6$, ${}_aR_{10}$, ${}_bR_6$, ${}_cR_{10}$, write R_a set of ordered pair.

(H) If $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8\}$ and $C = \{2, 3, 5, 7, 11\}$ find $A \cap B$ and $A \cap C$, What do you conclude ?

(I) If $n(A) = 27$, $n(B) = 35$ and $n(A \cup B) = 50$ find $n(A \cap B)$.

Section—B

(Long Answer Type Questions)

Note : Attempt any *two* questions.

2. (a) Transform the equation : 6

$$\left(1 - x^2\right)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + a^2y = 0$$

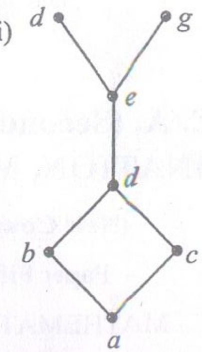
where $x = \sin\theta$.

(b) State and prove Euler's theorem. 6

3. (a) Determine whether the ahead Hass diagrams represent lattice or not.

(i)

(ii)



(b) If A, B, C, be sets, then prove : 6

$$A - (A \cup C) = (A - B) \cap (A - C)$$

4. (a) Let $A = \{a, b\}$ 6

$$R = \{(a, a), (b, a), (b, b)\}$$

$$S = \{(a, b), (b, a), (b, b)\}$$

Then verify $(SOR)^{-1} = R^{-1} O S^{-1}$.

(b) If $u = e^{xyz}$; show that : 6

$$\frac{\partial^3 u}{\partial x\, \partial y\, \partial z} = \left(1 + 3\,xyz + x^2y^2z^2\right)e^{xyz}$$

5. (a) Out of 880 students, 224 play cricket, 240 play hockey and 336 play basket ball, 64 play both basket ball and hockey, 80 play cricket and basket ball, 40 play hockey and cricket, 24 play all the three games. How many do not play any game. 6

(b) If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ show that : 6

$$f(x) + f(y) = f\left(\frac{x+y}{1+xy}\right)$$

Section—C

(Long Answer Type Questions)

Note : Attempt any *two* questions.

6. (a) Find the shortest distance between the line : 6

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}; \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$$

Hence show that the lines are coplanar.

(b) A variable plane is at a constant distance p from the origin and meets the co-ordinate axes in A, B, C. Show that the locus of the centroid of the tetrahedron OABC is : 6

$$x^{-2} + y^{-2} + z^{-2} = 16p^{-2}$$

7. (a) Change the order of integration 6

$$\int_0^\infty \int_0^x e^{-x^2/y} dx\, dy \text{ and evaluate.}$$

(b) Evaluate : 6

$$\int_0^{\pi/2} \int_{\pi/2}^{\pi} \cos(x+y)\, dy\, dx$$

8. (a) Evaluate : 6

$$\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} \left(x^2 + y^2 + z^2\right) dx\, dy\, dz$$

(b) Find the equation of sphere through the circle $x^2 + y^2 + z^2 = 9$, $2x + 3y + 4z = 5$ and the point (1, 2, 3). 6

9. Find the maximum value of u, where $u = \sin x \sin y \sin(x+y)$. 12