2017/EVEN/07/20/BSMP/
BSBP–603/591

UG Even Semester (CBCS) Exam., May—2017

(Pass)

(6th Semester)

Course No. : BSED–603 B

The figures in the margin indicate full marks for the questions

Mathematics pass students will answer BSMP–603
and Botany pass students will answer BSBP–603

MATHEMATICS

Course No. : BSMP–603

(Vector, Statics and Dynamics)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

1. *(a)* Determine the equation of the plane passing through the points P_1 (2, 1, 1), P_2 (3, 2, 1) and P_3 (1, 2, 1). 3

(b) Define curl, divergence and gradient. 6

(c) Prove that

(A) (A) ^2A. 5

OR

2. *(a)* Given $\vec{A}$ $2\hat{i}$ $3\hat{j}$ $\hat{k}$, $\vec{B}$ $4\hat{i}$ $\hat{j}$ $3\hat{k}$. Find *(i)* $\vec{A}$ $\vec{B}$, *(ii)* $\vec{A}$ $\vec{B}$ and *(iii)* projection of $\vec{A}$ on the vector $\vec{B}$. 3

(b) For a scalar (x, y, z) $(x^2$ y^2 $z^2)$ $^{1/2}$, find gradient at (2, –2, –1). Find directional derivatives of (x, y, z) at (2, –1, –2). 6

(c) Prove that

(A B) B (A) A (B) 5

3. *(a)* A particle moves in a straight line under an attraction of force towards a fixed point on the line varying inversely as the square of the distance from the fixed point. Find expression for acceleration, velocity and time taken by the particle at any instant. 9

(b) Show that the time of descent to the centre of force varying inversely as the square of the distance from the centre through first half of its initial distance is that through the last half as (2):(2). 5

OR

4. *(a)* A particle moves in a straight line towards a centre of force / (distance)^3 starting from rest at a distance a from the centre of force. Show that time of reaching a point distant b from the centre of force is $a\{(a^2 \quad b^2) / \ \}^{1/2}$ and its velocity then is $\{ \ (a^2 \quad b^2)\}^{1/2} / ab$. Show that the time to reach centre is $\frac{a^2}{\sqrt{\ }}$. 9

(b) A particle falls towards the earth from infinity. Show that its velocity on reaching earth's surface is same as that which it would have acquired in falling with constant acceleration and through a distance equal to earth's radius. 5

5. *(a)* Find expression for acceleration, velocity and position of the particle at any instant of a simple harmonic motion. Explain the nature of the motion. 9

(b) A particle is moving with SHM and while making an excursion from one position of rest to the other, its distances from the middle point of its path at three consecutive seconds are observed to be

x_1, x_2, x_3. Prove that the time of a complete oscillation is $2 \ / \cos^{1}\{(x_1 \quad x_3) / 2x_2\}$. 5

OR

6. *(a)* Define kinetic energy. Find expression for kinetic energy of a body of mass m with velocity v. State and prove principle of work-energy. 1+3+5=9

(b) Define direct impact and oblique impact. State Newton's law of restitution for direct and oblique impact. 5

7. *(a)* Find analytic expression for the resultant of two given forces. 6

(b) Find expression for components of a given single force. 3

(c) Two forces P and Q acting on a particle at an angle have a resultant $(2k \quad 1)\sqrt{P^2 \quad Q^2}$. When they act an angle 90 , the resultant becomes $(2k \quad 1)\sqrt{P^2 \quad Q^2}$. Prove that

$$\tan \quad (k \quad 1) / (k \quad 1)$$ 5

OR

8. *(a)* Find expression for resultant of several coplanar forces simultaneously acting at a point. 6

(b) If the resultant of two forces acting on a particle be at right angle to one of them and its magnitude be one-third of the magnitude of the other, then show that the ratio of the larger force to the smaller is $3 : 2\sqrt{2}$. 3

(c) The lines of action of two forces P Q, P Q make an angle 2 with one another and their resultant makes an angle with the bisector of the angle between them. Show that $P\tan$ $Q\tan$. 5

9. *(a)* State and prove Lami's theorem. 7

(b) Prove that if three coplanar forces acting on a rigid body be in equilibrium, then they must either meet at a point or else all must be parallel to one another. 7

OR

10. *(a)* Define centre of gravity of a body. Determine centre of gravity of a thin uniform rod. 7

(b) Determine centre of gravity of the system of three rods forming a triangle. 7

BOTANY

Course No. : BSBP–603

(Plant Physiology and Biochemistry)

Full Marks : 50
Pass Marks : 20

Time : 2 hours

1. *(a)* Describe the 'mass flow' hypothesis of translocation of solutes in plants. Write its merits and demerits. 5

(b) Describe various physical processes involved in the movement of materials into and out of the cells in plants. 5

OR

2. *(a)* Explain osmosis pressure and osmotic pressure. Describe how these are related to the life of plant. 5

(b) What is translocation? Describe the process of translocation of solutes in plants. 5

3. *(a)* What is phosphorylation? Give an account of non-cyclic photo-phosphorylation. 5

(b) Give an account of morphological and anatomical adaptation of hydrophytes. 5

OR

4. *(a)* What is 'dark reaction' in photosynthesis? How does it take place in C_3 plants? 5

(b) Give an account of various processes involved in formation of soil. 5

5. *(a)* Describe various steps of citric acid cycle. 5

(b) Give an account on photorespiration. 5

OR

6. *(a)* Explain various steps of glycolysis. Which part of the cell does the process occur? 5

(b) Give an account on oxidative phosphorylation. 5

7. *(a)* Enumerate major and minor elements in plants nutrition and explain their roles. 5

(b) Describe the mechanism of biological N_2 fixation in root nodules of leguminous plants. 5

OR

8. *(a)* What are macroelements? Write role of NPKS in plant growth and metabolism. 5

(b) How are the nitrites converted into ammonia by the plants? 5

9. *(a)* What is seed dormancy? What are its causes? 5

(b) Write an essay on photoperiodism. 5

OR

10. *(a)* Give an account of auxins with reference to their discovery and physiological effects in plants. 5

(b) Describe the sequential stages of typical xerosere. 5

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