BSC. PART - II EXAMINATION - 2018

MATHEMATICS SUB/ GEN

Answer eight questions selecting at least one from each Group in which Q. No. 1 is compulsory

1. Choose the correct answer of the following :-

(a) The degree of a differential equation $\frac{d^3y}{dx^3}-\sqrt{x^2\left(\frac{dy}{dx}\right)^{1/3}}=0$ is

(i) 3 (ii) 1 (iii) 6 (iv) None of these

(b) Integrating factor of diff. equation $\frac{dy}{dx}+y\log x=2\cos x$ is

(i) log sin x (ii) $\frac{x^2}{2}$ (iii) x (iv) None of these

(c) The equation of tangent at $(-1, 2)$ to the curve $2x^2+3y^2=14$ is given by

(i) $x-3y+7=0$ (ii) $x-4y+7=0$ (iii) $x-7y+3=0$ (iv) None of these

(d) If l, m, n be the direction Co-sines of a line then -

(i) $l+m+n=0$ (ii) $l^2+m^2+n^2=0$ (iii) $l^2+m^2+n^2=1$ (iv) None of these

(e) The Cartesian equation of a Common catenary is -

(i) $S=c\tan\psi$ (ii) $s=c\sec\psi$ (iii) $y=C\cosh\left(x/c\right)$ (iv) None of these

(f) Order of the homogeneous function $u=\frac{x^5\left(x^3-y^3\right)}{x^3+y^3}$ is

(i) 3 (ii) 2 (iii) 5 (iv) None of these

(g) Transverse acceleration of a particle moving along a curve in a plane is

(i) $r^2\theta$ (ii) $\frac{d}{dt}\left(r^2\theta\right)$ (iii) $\frac{1}{r}\frac{d}{dt}\left(r^2\theta\right)$ (iv) None of these

(h) $\lim_{x\to 0}\frac{a^x-1}{x}=$......

(i) $\log_e x$ (ii) e^a (iii) a^x (iv) None of these

GROUP-A

2. (a) Find the Standard equation of an ellipse.

(b) Find the equation of a normal to the Hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ at (x_1, y_1)

3. Find Co-ordinates of Vertex and focus of the parabola $16x^2-24xy+9y^2+77x-64y+95=0$

4. (a) Find the equation of the plane passing through the intersection of the planes $x+2y+3z-4=0$ and $2x+y-z+5=0$

(b) Find λ so that the lines $\frac{x+1}{-3}=\frac{y-2}{2\lambda}=\frac{z-3}{2}$ and $\frac{2x-3}{3\lambda}=\frac{y-5}{1}=\frac{z-6}{-5}$ are perpendicular to each other

5. (a) Find the equation of a sphere which pass through the origin and makes intercepts a,b,c from Co-ordinate areas.

(b) Find the equation of a cone whose vertex is (α, β, γ) and base $ax^2+by^2=1, Z=0$.

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GROUP - B

6. Solve any two of the following :-

(a) $\left(x^2-y^2\right)\frac{dy}{dx}=2xy$ (b) $\frac{dy}{dx}+y\cot x=2\,Cos x$ (c) $\frac{dy}{dx}=\frac{x+2y-3}{2x+y-3}$

7. Solve any two of the following :-

(a) $y=(1+p)x+ap^2$ (b) $y=2p+p^2$ (c) $x=y-p^2$

8. (a) Prove that the system of parabola $y^2=4a(x+a)$ is self orthogonal

(b) Solve $x\frac{dy}{dx}=1+y^2$, when $x=\pi/2$ and $y=1$

9. Solve any two of the following :

(a) $\frac{d^2y}{dx^2}-a^2y=e^{ax}$ (b) $\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+4\frac{dy}{dx}-2y=e^x+\cos x$

(c) $\frac{d^2y}{dx^2}+y=\cos 2x$

GROUP - C

10. (a) Prove that a system of coplanar forces acting upon a rigid body can be reduced to a single force acting at any arbitrary point and couple whose moment is equal to the sum of the moments of the given forces about that point.

(b) Forces, PQ and R acting along the sides of a triangle formed by the lines $x=0$, $y=0$ and $x\cos\theta+y\sin\theta=p$ respectively, the area of rectangular. Find the magnitude of resultant and equation of the line of action.

11. (a) Find the intrinsic equation of a common catenary.

(b) A uniform chain of length ℓ is to be suspended from two points A and B in the same horizontal line so that the terminal tension is n times that at the lower point then show that the span AB must be $\frac{\ell}{\sqrt{n^2-1}}\log\left\{n+\sqrt{n^2-1}\right\}$

12. (a) A particle is moving in a plane. Find the components of its velocity along the radius vector and perpendicular to it.

(b) The co-ordinates of a moving point at a time t are given by $x=a(t-\sin t)$ and $y=a(1\ \cos t)$ show that it moves with constant acceleration.

13. A particle falling under gravity in a medium whose resistance varies as the velocity. find the motion of the particle.

GROUP - D

14. Examine the continuity and differntiability of the function $f(x)$ at $x=0$ where

$$f(x)=x^2\sin\frac{1}{x},\ x\neq 0$$
$$=0 \qquad ,\ x=0$$

15. State and porve Lagrange's mean value theorem and give its geometrical interpretion.

16. (a) If $n=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ then show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\tan u$

(b) State and prove Euler's theorem on homogeneous function in two variables.

17. (a) Discuss the necessary and sufficient conditions for $f(x,y)$ to have extreme value at (a,b).

(b) Discuss the maximum and minimum values of $u=x^3+y^3-3axy$

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