



# Sanjay Ghodawat University, Kolhapur

2017-18

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

FY B. Sc.

School of Science

Semester II

MT 102

Mathematics -II

Max Marks: 100

May 2018

End Semester Examination (ESE)

Time: 3 Hrs.

26<sup>th</sup> May 2018

10:30 AM to 1:30 PM.

Instructions for Students: 1) Use of non-programmable calculator is allowed  
2) All questions are compulsory

|           |  | Marks     | COs |
|-----------|--|-----------|-----|
| <b>Q1</b> | Choose the correct Alternative for each of following questions.  | <b>16</b> |     |
| a)        | If the equation $M dx + N dy = 0$ is homogeneous and $Mx + Ny \neq 0$ then IF=.....<br>i) $\frac{1}{Mx - Ny}$ ii) $\frac{1}{Mx + Ny}$ iii) $\int e^{f(x)} dx$ iv) $\int e^{f(y)} dy$   | 02        | CO1 |
| b)        | For the differential equation $(D^3 + 3D^2 + 3D + 1)y = e^{-x}$<br>Particular integral (P.I) is -----<br>i) $\frac{x^3}{6} e^{-x}$ ii) $\frac{x^3}{4} e^{-x}$ iii) $\frac{x^3}{2} e^{-x}$ iv) $\frac{x^3}{8} e^{-x}$                 | 02        | CO2 |
| c)        | $\frac{1}{D^3}(e^{2x}) = \dots\dots\dots$<br>i) $\frac{e^{2x}}{6}$ ii) $\frac{e^{2x}}{8}$ iii) $\frac{e^{3x}}{5}$ iv) $\frac{e^{3x}}{8}$   | 02        | CO2 |
| d)        | The values of P,Q & R in simultaneous equation $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$<br>represents -----<br>i) d.r.s of tangent to the curve ii) d.r.s of any line<br>iii) d.c.s of any line iv) d.r.s of normal to the curve | 02        | CO3 |
| e)        | The total differential equation $P dx + Q dy + R dz = 0$ is  | 02        | CO4 |

$$\text{integrable if } \begin{vmatrix} P & Q & R \\ P & Q & R \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \end{vmatrix} = \text{-----}$$

- i) 1                      ii) PQR                      iii) 0                      iv) -1

f) If  $u = \log(x^3 + y^3 - x^2y - y^2x)$  then  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = \text{-----}$

02 CO5

- i)  $\frac{1}{x+y}$     ii)  $\frac{2}{x+y}$     iii)  $\frac{3}{x+y}$     iv)  $\frac{4}{x+y}$

g) The differential equation obtained from the relation  $z = (x+a)(y+b)$  is -----

02 CO6

- i)  $z = 2pq$               ii)  $z = pq^2$               iii)  $z = p^2q$               iv)  $z = pq$

h) For the partial differential equation  $q = 2yp^2$  solution is-----

02 CO6

- i)  $z = ax + ay + c$               ii)  $z = ax + ay^2 + c$

- iii)  $z = \sqrt{ax} + ay^2 + c$               iv)  $z = ax^2 + ay + c$

**Q2** Solve any two of the following questions.

14  
07 CO1

a) Solve  $\frac{dy}{dx} = 2y + 3e^x$

b) Show that the necessary and sufficient condition for

07 CO1

$M dx + N dy = 0$  is to be exact is  $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

c) Solve  $(x^2 + y^2 + 1)dx - 2xy dy = 0$

07 CO1

**Q3** Solve any two of the following questions.

14  
07 CO2

a) Prove that  $\frac{1}{f(D^2)} \sin ax = \frac{1}{f(-a^2)} \sin ax$

b) Solve  $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{4x}$

07 CO2

c) Solve  $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 2x$

07 CO2

**Q4** Solve any two of the following questions.

14

- a) Solve  $\frac{dx}{yz} = \frac{dy}{zx} = \frac{dz}{xy}$  07 CO3
- b) Solve  $\frac{dx}{mz - ny} = \frac{dy}{nx - lz} = \frac{dz}{ly - mx}$  07 CO3
- c) Solve  $\frac{dx}{x^2 - yz} = \frac{dy}{y^2 - zx} = \frac{dz}{z^2 - xy}$  07 CO3

- Q5** Solve **any two** of the following questions. 14
- a) Prove that the necessary and sufficient condition of integrability of  $Pdx + Qdy + Rdz = 0$  07 CO4
- b) Solve  $(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0$  07 CO4
- c) Solve  $(x - y)dx - xdy + zdz = 0$  07 CO4

- Q6** Solve **any two** of the following questions. 14
- a) If  $u = \operatorname{cosec}^{-1} \sqrt{\frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}}$ ; prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = -\frac{1}{12} \tan u$  07 CO5
- b) If  $x = e^v \sec u, y = e^v \tan u$  then show that  $JJ' = 1$
- c) If  $u = x^y$ ; then prove that  $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$  07 CO5

- Q7** Solve **any two** of the following questions. 14
- a) Form the partial differential equation by eliminating arbitrary function  $\phi(u, v) = 0$  where  $u$  and  $v$  are functions of  $x, y$  &  $z$  07 CO6
- b) Solve  $px + qy = pq$  by using Charpit's Method 07 CO6
- c) Find the complete integral of  $p^3 + q^3 = 3pqz$  07 CO6

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