SLR-TX – 17

Seat No.	

Set **P**

F.E. (Part – II) (CGPA) (Old) Examination, 2018
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 19-11-2018 Max. Marks : 70

Time : 10.00 a.m. to 1.00 p.m.

Instructions : *1) Q. No.* ***1*** *is* ***compulsory****. It should be solved in* ***first 30 minutes*** *in Answer Book Page No.* ***3****.* ***Each*** *question carries* ***one*** *mark.*

2) ***Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.***

3) ***Use*** *of non-programmable calculator is* ***allowed****.*

4) Figures to the ***right*** *indicate* ***full*** *marks.*

MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct alternative : **(14×1=14)**

1) Among the following which method is best for solving initial value problem ?

a) Euler's method b) Picard's method

c) Taylor's series method d) R-K method of order 4

2) If $\frac{dy}{dx} = x + y$ with y(0) = 1 and h = 0.2 then by Eulers method the approximate value of y(0.2) is equals to

a) 1 b) 1.2 c) 1.4 d) – 1.2

3) In the Newton's forward difference formula $\left[\frac{d^2y}{dx^2}\right]_{x=x_0} = \frac{1}{h^2}\left[\Delta^2 y_0 - \Delta^3 y_0 + k...\right]$ the value of K is

a) $\frac{12}{11}\Delta^4 y_0$ b) $\frac{-11}{12}\Delta^4 y_0$ c) $-\Delta^4 y_0$ d) $\frac{11}{12}\Delta^4 y_0$

4) To find the value of the derivatives numerically at the beginning or near to the beginning value of argument x, we use

a) Newton's forward difference formula b) Newton's backward difference formula

c) Central difference formula d) Divided difference formula

5) If K is a constant, the curve whose subnormal is equal to the abscissa is

a) $y^2 - x^2 = K$ b) $x^2 + y^2 = K$ c) $y - x = K$ d) $x + y = K$

P.T.O.

6) The differential equation $\frac{dy}{dx} = \frac{a_1x + b_1y + c_1}{a_2x + b_2y + c_2}$ will be exact if

a) $b_2 = -a_1$ b) $a_2 = -b_1$ c) $b_1 = a_2$ d) $a_1 = b_2$

7) The integrating factor of the D.E. $\frac{dy}{dx} + \frac{2xy}{1+x^2} = 0$ is

a) e^{-x} b) x c) $1 + x^2$ d) $\frac{1}{1+x^2}$

8) The beta function B(m, n) converges for

a) $m \geq -1, n \geq -1$ b) $m > 0, n \geq -2$ c) $m \geq -1, n > 1$ d) $m > 0, n > 0$

9) If $I(a) = \int_0^1 \frac{x^a - 1}{\log x} dx$ then $\frac{dI}{da} =$

a) $\frac{1}{a-1}$ b) $\frac{1}{a+1}$ c) $\frac{-1}{a+1}$ d) $\frac{1}{\log a}$

10) The curve $x^3 + y^3 = 3xy$ is symmetrical about

a) The line y = x b) x – axis c) y – axis d) both axes

11) The length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is given by

a) $\int_{\theta_1}^{\theta_2} \left[r^2 + \left(\frac{dr}{d\theta}\right)\right]^2$

b) $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}.dr$

c) $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}.d\theta$

d) None of these

12) The value of $\int_0^\infty \int_0^\infty \frac{dx\,dy}{(1+x^2)(1+y^2)}$ is

a) $\frac{\pi^2}{2}$ b) $\frac{\pi^2}{4}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

13) For $\int_0^a \int_0^x f(x, y)\,dy\,dx$ the change of order is

a) $\int_0^a \int_y^a f(x, y)\,dx\,dy$ b) $\int_0^a \int_0^y f(x, y)\,dx\,dy$ c) $\int_0^x \int_0^a f(x, y)\,dx\,dy$ d) None of these

14) If the density at any point varies as the distance of the point from the x-axis, then ρ is equal to

a) Kx b) Kxy c) Ky d) $K(x^2 + y^2)$

Set P

SLR-TX – 17

Seat No.	

F.E. (Part – II) (CGPA) (Old) Examination, 2018
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 19-11-2018 Marks : 56
Time : 10.00 a.m. to 1.00 p.m.

Instructions : *1) Attempt **any three** questions from **each** Section.*
*2) **Use** of non-programmable calculator is **allowed**.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

2. a) Solve $\frac{dy}{dx} = \frac{6x - 2y - 7}{3x - y + 4}$. **3**

b) Solve $(\sin x \cos y + e^{2x})dx + (\cos x \sin y + \tan y)dy = 0$. **3**

c) Solve $(1 + x^2)dy = (e^{\tan^{-1}x} - y)dx$. **4**

OR

c) Solve $xy - \frac{dy}{dx} = y^3 e^{-x^2}$

3. Attempt the following :

a) Find orthogonal trajectories of the family of curves $x^p + cy^p = 1$ where c is parameter and p is constant. **3**

b) Show that all curves for which the square of the normal is equal to the square of the radius vector are either circles or rectangular hyperbolas. **3**

c) Water at temperature 100°C cools in 10 minutes to 88°C in a room of temperature 25°C. Find the temperature of water after 20 minutes. **3**

4. a) From the following data find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1 and x = 2.1. **5**

x :	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

b) From the following table find $\frac{dy}{dx}$ at x = 1. **4**

x :	– 1	1	2	3
y :	– 21	15	12	3

Set P

5. Attempt the following :

   a) Find approximate value of y when x = 0.1, if $\frac{dy}{dx} = x - y^2$ and y = 1 at x = 0, using Taylor's method. **3**

   b) Solve $\frac{dy}{dx} = 2 + \sqrt{xy}$ with y(1.2) = 1.6403 by Euler's modified method for x = 1.4, taking h = 0.2. **3**

   c) Using Runge-Kutta method of fourth order find y(0.1), given that $\frac{dy}{dx} = xy + y^2$ with y(0) = 1 in one step. **3**

SECTION – II

6. a) Evaluate $\int_0^\infty x^{n-1} e^{-h^2x^2} dx$. **3**

   b) Evaluate $\int_0^2 x^7 (16 - x^4)^{10} dx$. **3**

   c) Evaluate $\int_0^\infty \frac{e^{-x}}{x}\left(1 - e^{-ax}\right) dx$. **3**

7. a) Trace the curve $y^2 (4 - x) = x(x - 2)^2$ with justification. **3**

   b) Trace the curve x = a (t + sint), y = a (1 + cost) with justification. **3**

   c) Find the perimeter of the Cardioid r = a (1 + cosθ). **3**

8. a) Evaluate $\int_0^2 \int_1^z \int_0^{yz} xyz \, dx \, dy \, dz$. **3**

   b) Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dx\,dy}{1 + x^2 + y^2}$. **3**

   c) Change the order of integration and evaluate $\int_0^1 \int_{\sqrt{x}}^1 e^{x/y} \, dx \, dy$. **4**

   OR

   c) Change to polar co-ordinate and evaluate $\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2 - y^2}} \log(x^2 + y^2) \, dx dy$.

9. a) Find the volume generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the x-axis. **3**

   b) Find the mass distributed over the area bounded by the curve $16y^2 = x^3$ and the line 2y = x, if the density at any point varies as the distance of the point from x-axis. **3**

   c) Find the area between the circles r = 2 sinθ and r = 4 sinθ. **3**

Set P

Seat No.	

Set **Q**

F.E. (Part – II) (CGPA) (Old) Examination, 2018
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MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

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1) The beta function B(m, n) converges for
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a) $\frac{\pi^2}{2}$ b) $\frac{\pi^2}{4}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

P.T.O.

6) For $\int_0^a \int_0^x f(x, y)\,dy\,dx$ the change of order is

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Set Q

Seat No.	

F.E. (Part – II) (CGPA) (Old) Examination, 2018
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 19-11-2018 Marks : 56
Time : 10.00 a.m. to 1.00 p.m.

Instructions : *1) Attempt **any three** questions from **each** Section.*
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SECTION – I

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x :	– 1	1	2	3
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Set Q

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c) Change to polar co-ordinate and evaluate $\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2 - y^2}} \log(x^2 + y^2)\, dxdy$.

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Set Q

Seat No.	

Set **R**

F.E. (Part – II) (CGPA) (Old) Examination, 2018
ENGINEERING MATHEMATICS – II

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MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct alternative : **(14×1=14)**

1) If K is a constant, the curve whose subnormal is equal to the abscissa is
a) $y^2 - x^2 = K$ b) $x^2 + y^2 = K$ c) $y - x = K$ d) $x + y = K$

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P.T.O.

7) The length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is given by

a) $\int_{\theta_1}^{\theta_2} \left[r^2 + \left(\frac{dr}{d\theta} \right) \right]^2$ b) $\int_{\theta_1}^{\theta_2} \sqrt{r^2 + \left(\frac{dr}{d\theta} \right)^2} .dr$

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Set R

SLR-TX – 17

Seat No.	

F.E. (Part – II) (CGPA) (Old) Examination, 2018
ENGINEERING MATHEMATICS – II

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SECTION – I

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Set R

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SECTION – II

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Set R

Seat No.	

Set **S**

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*2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.***
*3) **Use** of non-programmable calculator is **allowed**.*
*4) Figures to the **right** indicate **full** marks.*

MCQ/Objective Type Questions

Duration : 30 Minutes Marks : 14

1. Choose the correct alternative : **(14×1=14)**

1) The curve $x^3 + y^3 = 3xy$ is symmetrical about
a) The line y = x b) x – axis c) y – axis d) both axes

2) The length of the curve $r = f(\theta)$ from $\theta = \theta_1$ to $\theta = \theta_2$ is given by
a) $\int_{\theta_1}^{\theta_2}\left[r^2+\left(\frac{dr}{d\theta}\right)\right]^2$
b) $\int_{\theta_1}^{\theta_2}\sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,.dr$
c) $\int_{\theta_1}^{\theta_2}\sqrt{r^2+\left(\frac{dr}{d\theta}\right)^2}\,.d\theta$
d) None of these

3) The value of $\int_0^\infty\int_0^\infty \frac{dx\,dy}{(1+x^2)(1+y^2)}$ is
a) $\frac{\pi^2}{2}$ b) $\frac{\pi^2}{4}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

4) For $\int_0^a\int_0^x f(x, y)\,dy\,dx$ the change of order is
a) $\int_0^a\int_y^a f(x,y)\,dx\,dy$ b) $\int_0^a\int_0^y f(x, y)dx\,dy$ c) $\int_0^x\int_0^a f(x,y)dx\,dy$ d) None of these

P.T.O.

5) If the density at any point varies as the distance of the point from the x-axis, then ρ is equal to

a) Kx b) Kxy c) Ky d) $K(x^2 + y^2)$

6) Among the following which method is best for solving initial value problem ?

a) Euler's method b) Picard's method
c) Taylor's series method d) R-K method of order 4

7) If $\frac{dy}{dx} = x + y$ with y(0) = 1 and h = 0.2 then by Eulers method the approximate value of y(0.2) is equals to

a) 1 b) 1.2 c) 1.4 d) – 1.2

8) In the Newton's forward difference formula $\left[\frac{d^2y}{dx^2}\right]_{x=x_0} = \frac{1}{h^2}\left[\Delta^2 y_0 - \Delta^3 y_0 + k...\right]$ the value of K is

a) $\frac{12}{11}\Delta^4 y_0$ b) $\frac{-11}{12}\Delta^4 y_0$ c) $-\Delta^4 y_0$ d) $\frac{11}{12}\Delta^4 y_0$

9) To find the value of the derivatives numerically at the beginning or near to the beginning value of argument x, we use

a) Newton's forward difference formula b) Newton's backward difference formula
c) Central difference formula d) Divided difference formula

10) If K is a constant, the curve whose subnormal is equal to the abscissa is

a) $y^2 - x^2 = K$ b) $x^2 + y^2 = K$ c) $y - x = K$ d) $x + y = K$

11) The differential equation $\frac{dy}{dx} = \frac{a_1x + b_1y + c_1}{a_2x + b_2y + c_2}$ will be exact if

a) $b_2 = -a_1$ b) $a_2 = -b_1$ c) $b_1 = a_2$ d) $a_1 = b_2$

12) The integrating factor of the D.E. $\frac{dy}{dx} + \frac{2xy}{1+x^2} = 0$ is

a) e^{-x} b) x c) $1 + x^2$ d) $\frac{1}{1+x^2}$

13) The beta function B(m, n) converges for

a) $m \geq -1, n \geq -1$ b) $m > 0, n \geq -2$ c) $m \geq -1, n > 1$ d) $m > 0, n > 0$

14) If $I(a) = \int_0^1 \frac{x^a - 1}{\log x} dx$ then $\frac{dI}{da} =$

a) $\frac{1}{a-1}$ b) $\frac{1}{a+1}$ c) $\frac{-1}{a+1}$ d) $\frac{1}{\log a}$

Set S

SLR-TX – 17

Seat No.	

F.E. (Part – II) (CGPA) (Old) Examination, 2018
ENGINEERING MATHEMATICS – II

Day and Date : Monday, 19-11-2018 Marks : 56
Time : 10.00 a.m. to 1.00 p.m.

Instructions : *1) Attempt **any three** questions from **each** Section.*
*2) **Use** of non-programmable calculator is **allowed**.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

2. a) Solve $\frac{dy}{dx}=\frac{6x-2y-7}{3x-y+4}$. **3**

b) Solve $(\sin x \cos y + e^{2x})dx + (\cos x \sin y + \tan y)dy = 0$. **3**

c) Solve $(1 + x^2)dy = (e^{\tan^{-1}x} - y)dx$. **4**

OR

c) Solve $xy-\frac{dy}{dx}=y^3e^{-x^2}$

3. Attempt the following :

a) Find orthogonal trajectories of the family of curves $x^p + cy^p = 1$ where c is parameter and p is constant. **3**

b) Show that all curves for which the square of the normal is equal to the square of the radius vector are either circles or rectangular hyperbolas. **3**

c) Water at temperature 100°C cools in 10 minutes to 88°C in a room of temperature 25°C. Find the temperature of water after 20 minutes. **3**

4. a) From the following data find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1 and x = 2.1. **5**

x :	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

b) From the following table find $\frac{dy}{dx}$ at x = 1. **4**

x :	– 1	1	2	3
y :	– 21	15	12	3

Set S

5. Attempt the following :

a) Find approximate value of y when x = 0.1, if $\frac{dy}{dx} = x - y^2$ and y = 1 at x = 0, using Taylor's method. **3**

b) Solve $\frac{dy}{dx} = 2 + \sqrt{xy}$ with y(1.2) = 1.6403 by Euler's modified method for x = 1.4, taking h = 0.2. **3**

c) Using Runge-Kutta method of fourth order find y(0.1), given that $\frac{dy}{dx} = xy + y^2$ with y(0) = 1 in one step. **3**

SECTION – II

6. a) Evaluate $\int_0^\infty x^{n-1} e^{-h^2x^2} dx$. **3**

b) Evaluate $\int_0^2 x^7 (16 - x^4)^{10} dx$. **3**

c) Evaluate $\int_0^\infty \frac{e^{-x}}{x}\left(1 - e^{-ax}\right) dx$. **3**

7. a) Trace the curve $y^2 (4 - x) = x(x - 2)^2$ with justification. **3**

b) Trace the curve x = a (t + sint), y = a (1 + cost) with justification. **3**

c) Find the perimeter of the Cardioid r = a (1 + cosθ). **3**

8. a) Evaluate $\int_0^2 \int_1^z \int_0^{yz} xyz \, dx\, dy\, dz$. **3**

b) Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dx\, dy}{1 + x^2 + y^2}$. **3**

c) Change the order of integration and evaluate $\int_0^1 \int_{\sqrt{x}}^1 e^{x/y} dx\, dy$. **4**

OR

c) Change to polar co-ordinate and evaluate $\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2-y^2}} \log(x^2 + y^2) dxdy$.

9. a) Find the volume generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the x-axis. **3**

b) Find the mass distributed over the area bounded by the curve $16y^2 = x^3$ and the line 2y = x, if the density at any point varies as the distance of the point from x-axis. **3**

c) Find the area between the circles r = 2 sinθ and r = 4 sinθ. **3**

Set S