Code No. 14002

FACULTY OF ENGINEERING

B.E. I-Year (Backlog) Examination, March/April 2021

Subject : Mathematics - II

Time: 2 hours **Max. Marks: 75**

Note: Missing Data, if any, may be suitably be assumed.

PART – A

Answer any seven questions. **(7x3=21 Marks)**

1 Find integrating factor of the differential equation
$(x^2y - 2xy^2)\,dx - (x^3 - 3x^2y)\,dy = 0$.

2 Find the orthogonal trajectories of family of curves $r^2 = a^2 \cos 2\theta$.

3 Solve $(D^2 + 1)y = 0$.

4 Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3x}$.

5 Define regular point and irregular singular point of the differential equation.

6 Show that $P_n'(1) = \frac{n(n+1)}{2}$.

7 Define Complementary error function. Show that $\text{erfc}(x) + \text{erfc}(-x) = 2$.

8 Write the properties of Bessel functions.

9 Find L(t sin 3t).

10 Find $L^{-1}\frac{(s^2 - 3s + 4)}{s^3}$.

PART – B

Answer any three questions. **(3x18 = 54 Marks)**

11 (a) Solve $\frac{dy}{dx} = \frac{x^2 + y^2 + 1}{2xy}$.

(b) A body originally at 80°C cools down to 60°C is 20 minutes, the temperature of the air being 40°C. What will be the temperature of the body after 40 minutes from the original.

12 (a) Solve by method of variation of parameters:

$$\frac{d^2y}{dx^2} + y = \tan x.$$

(b) Solve $\frac{d^2y}{dx^2} - \frac{3dy}{dx} + 2y = \sin 2x$.

13 (a) Solve in series of the equation $\frac{d^2y}{dx^2} + x^2y = 0$.

(b) Show that $nP_n(x) = xP_n'(x) - P_{n-1}'(x)$.

14 (a) Show that $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$.

(b) Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ where $m, n > 0$.

15 (a) Find $L\left(\int_0^\infty e^{-t} \cos t \, dt\right)$.

(b) Using convolution theorem, evaluate $L^{-1}\left(\frac{1}{(s^2+1)(s^2+9)}\right)$.

16 (a) Solve $x^2(y - px) = yp^2$.

(b) Solve $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$.

17 (a) Show that $\int_{-1}^{1} xP_n(x)P_{n-1}(x)dx = \frac{2n}{4n^2 - 1}$.

(b) Using Laplace Transform, solve the equation

$(D^2 + n^2)x = a\sin(nt + \alpha), x = Dx = 0 \quad at \quad t = 0$

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Code No: 14503/CBCS

FACULTY OF ENGINEERING

BE I - Semester (CBCS) (Backlog) Examination, March / April 2021

Subject: Engineering Mechanics-I

Time: 2 Hours **Max .Marks: 70**

Note: Missing data, if any, may be suitably assumed

PART – A

Answer any five questions. **(5x2=10 Marks)**

1 State lamis theorem.
2 Write down the difference between stable equilibrium, unstable equilibrium, neutral equilibrium.
3 Write down the vrignon's theorem for non-concurrent force system.
4 Explain coefficient of friction and angle of friction.
5 Write down the assumption made in the analysis of pin joint trusses.
6 State and explain triangular law of fore system.
7 Write down the characteristics of force.
8 What are the different factors which are not effecting the couple?
9 Classify the beam's based on the support condition.
10 What are the uses of wedge?

PART – B

Answer any four questions. **(4x15= 60 Marks)**

11 A block shown in fig-1 is acted up on by its weight W=400N and a horizontal force F=600N and also the pressure P exerted by the incline. The resultant R of these forces is parallel to the incline. Find P and R does the block move up or down the incline?

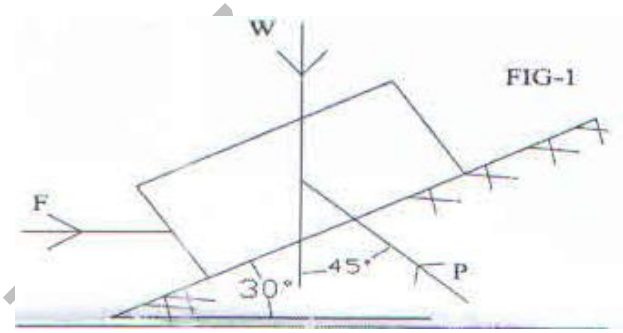

FIG-1

12 Determine the support reactions at A, B, & D for the beam shown in fig-2.

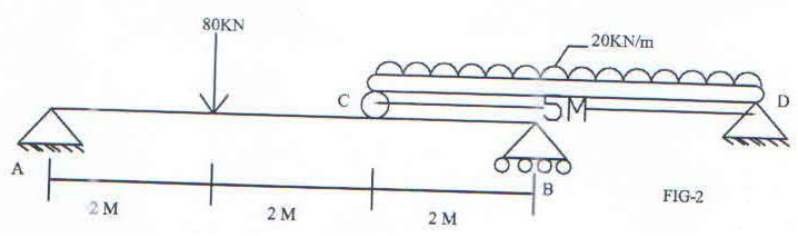

FIG-2

13 Locate the centroid of the plane area shown in fig-3 with reference to the given X-Y axes.

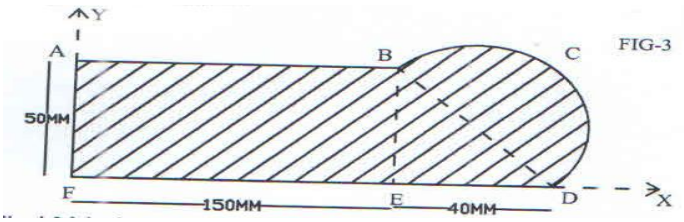

FIG-3

..2..

14 Find M.I about given axes as shown in fig-4

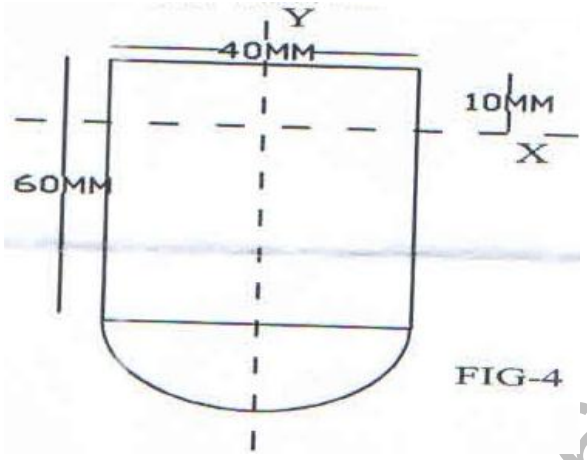

FIG-4

15 Find the maximum force P of the given wedge as shown in fig-5

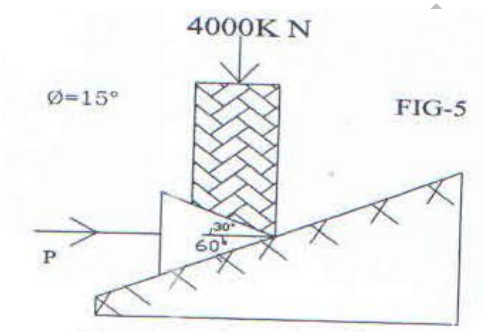

FIG-5

16 Find member forces of the given frame by using method of section.

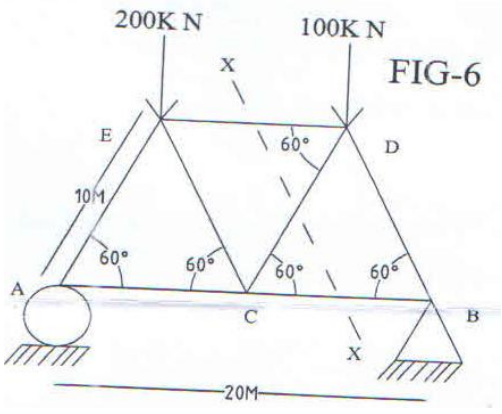

FIG-6

17 Write short note on:

(a) Method of frame
(b) Pappu's theorem
(c) Classification of forcess

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