

# AR18

**CODE: 18BST101**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**I B. Tech I Semester Regular Examinations, November, 2018**

## **LINEAR ALGEBRA AND CALCULUS (Common to all Branches)**

**Time: 3 Hours**

**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

### **UNIT-I**

1. a) Reduce the following matrix into Echelon form and hence find its rank. 6M

$$\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$

- b) Show that the only real number  $\lambda$  for which the system  $x + 2y + 3z = \lambda x$ ;  $3x + y + 2z = \lambda y$ ;  $2x + 3y + z = \lambda z$  has non-zero solution is 6 and solve them, when  $\lambda = 6$ . 6M

**(OR)**

2. Find the diagonal matrix orthogonally similar to the following real symmetric matrix. Also obtain the transforming matrix.  $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ . 12M

### **UNIT-II**

3. a) Verify Lagrange's Mean value theorem for the following function  $f(x) = x(x-1)(x-2)$  on  $[0, \frac{1}{2}]$ . 6M

- b) Find  $\frac{du}{dt}$ , if  $u = \ln(x+y+z)$ , where  $x = e^{-t}$ ,  $y = \sin t$ ,  $z = \cos t$ . 6M

**(OR)**

4. a) Expand  $x^3 + y^3 + xy^2$  in powers of  $(x-1)$  and  $(y-2)$  using Taylor's series. 6M

- b) Find the maximum and minimum values of  $f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$ . 6M

### UNIT-III

5. a) Find the length of the arc of the parabola  $x^2 = 4ay$  from vertex to one extremity of the latus rectum. 6M  
b) Find the volume of the solid generated by the revolution of the cardioid  $r = a(1 + \cos \theta)$  about the initial line  $\theta = 0$ . 6M
- (OR)
6. a) Find the area of the surface of revolution generated by revolving one arc of the curve  $y = \sin x$  about the x-axis from  $x = 0$  to  $\frac{\pi}{2}$ . 6M  
b) Find the volume of the solid generated by revolving the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  about the major axis. 6M

### UNIT-IV

7. a) Evaluate  $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} e^{y/x} dy dx$ . 6M  
b) Evaluate  $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz dz dy dx$ . 6M
- (OR)
8. a) By changing the order of integration, evaluate  $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dx dy$ . 6M  
b) Evaluate  $\iiint_V dx dy dz$  where  $V$  is the finite region of space formed by the planes  $x = 0, y = 0, z = 0$  and  $2x + 3y + 4z = 12$ . 6M

### UNIT-V

9. a) Find the directional derivative of  $2xy + z^2$  at  $(1, -1, 3)$  in the direction  $\vec{i} + 2\vec{j} + 3\vec{k}$ . 6M  
b) Find the work done in moving a particle in the force field  $\vec{F} = 3x^2 \vec{i} + (2zx - y) \vec{j} + z \vec{k}$ , along the curve defined by  $x^2 = 4y$  from  $x = 0$  to  $x = 2$ . 6M
- (OR)
10. Verify Green's theorem in the plane for  $\int_C (x^2 - xy^3) dx + (y^2 - 2xy) dy$  where  $C$  is a square with vertices  $(0, 0), (2, 0), (2, 2), (0, 2)$ . 12M

# AR16

**CODE: 16CE1001**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**I B.Tech I Semester Supplementary Examinations, November-2018**

**BUILDING MATERIALS AND CONSTRUCTION**

**(Civil Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## **UNIT-I**

1. a) What qualities in bricks are essentially required from construction point of view. 7  
b) Describe briefly the various effects of adding puzzolanas to cement concrete. 7
- (OR)**
2. a) Explain the defects in timber with neat sketches. 8  
b) Write short note on: 6  
(i) Lime mortar (ii) Lime-surkhi mortar

## **UNIT-II**

3. a) What is glass? Explain its types and uses. 7  
b) Describe the factors affecting strength of concrete 7
- (OR)**
4. a) Write a short note on: 8  
(i) Glass reinforced plastic (ii) Fibre reinforced plastic  
b) What is an alloy? Describe the properties and uses of brass and bronze. 6

## **UNIT-III**

5. a) Compare load bearing structure with framed structure. 8  
b) What are the requirements of a good foundation? 6
- (OR)**
6. a) What are the general principles in the stone masonry. 7  
b) What is partition wall? Explain the types of partition walls. 7

## **UNIT-IV**

7. a) Discuss the advantages of the G.I. sheet roof coverings over asbestos sheets. 7  
b) What is hollow concrete block? What is the difference between a hollow and solid concrete block? 7
- (OR)**
8. a) Discuss the various factors you considered for choosing floor tiles. 6  
b) List out different types of windows. Explain any four with neat sketches. 8

## **UNIT-V**

9. a) Define plastering? Explain the procedure of plastering on new surface. 7  
b) Explain with neat sketches types of pointings. 7
- (OR)**
10. a) Write short notes on: 7  
(i) Aluminium paint (ii) Bituminous paint (iii) Fire proof paint  
b) Define Scaffolding. What are the requirements of scaffolding. 7

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. Explain various system of forces with their characteristics and examples.

**(OR)**

2. a Explain the following
  - i) Parallelogram law and ii) Triangle law
- b A force  $P$  is applied at  $O$  to the string  $AOB$  as shown in Fig 1. If the tension in each part of the string is  $50\text{ N}$ , find the magnitude and direction of force  $P$  for equilibrium conditions.



Fig 1.

**UNIT-II**

3. State and prove Varignon's theorem.
- (OR)**
4. Two rollers of weights  $P$  and  $Q$  are connected by a flexible string  $AB$ . The rollers rest on two mutually perpendicular planes  $DE$  and  $EF$  as shown in Fig 2. Find the tension in the string and the angle  $\theta$  that it makes with the horizontal when the system is in equilibrium. Given  $P = 50\text{ N}$ ,  $Q = 100\text{ N}$ ,  $\alpha = 30^\circ$

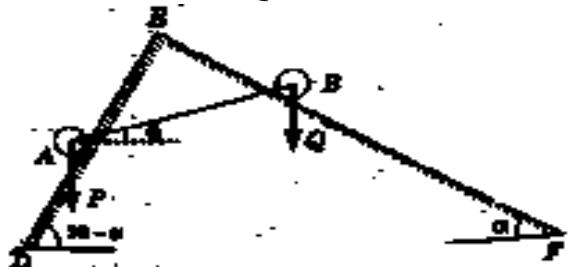


Fig 2

### UNIT-III

5. A four wheel drive car shown in the Fig. 3 has a mass of 2000 Kg with passengers. The roadway is inclined at an angle  $\theta$  with the horizontal. If the coefficient of static friction between the tyres and the road is 0.3, what is the maximum inclination  $\theta$  that the car can climb?

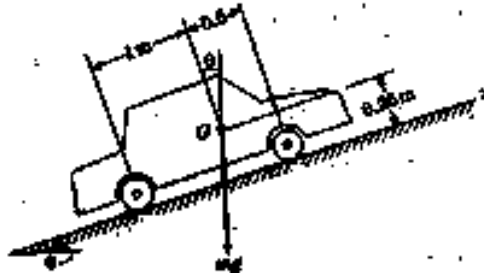


Fig 3

(OR)

6. State and explain theorems of Pappus and Guldinus.

### UNIT-IV

7. Determine the coordinates of centroid of the shaded area as shown in Fig. 4 calculate the moment of inertia of the shaded area w.r.t. the centroidal set of axes parallel respectively, to the x and y axes.

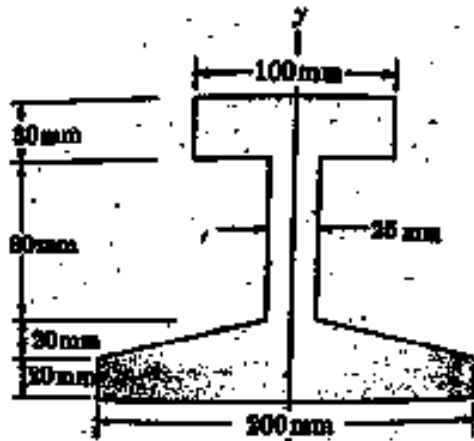


Fig 4

(OR)

8. Find the moment of inertia of the section shown in the Fig 5, about the centroidal axis XX perpendicular to the web.

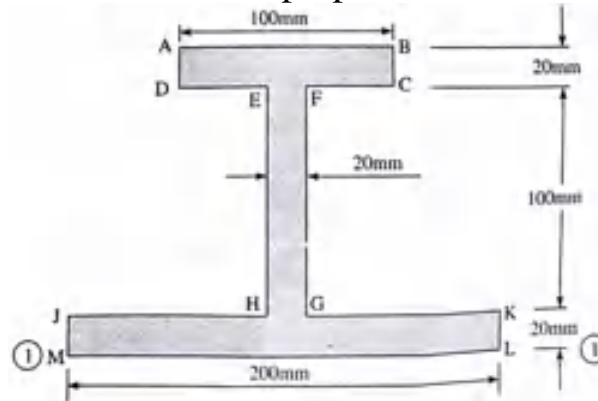


Fig 5

### UNIT-V

9. A ladder AE of length  $2l$  has its ends A and B resting against a floor and a wall as shown in Fig. 6. The ladder slips while its ends maintain contact with the floor and the wall. Show that the midpoint C of the ladder describes a circle of radius  $l$  with centre at O. Also show that any other point such as D describes an ellipse.

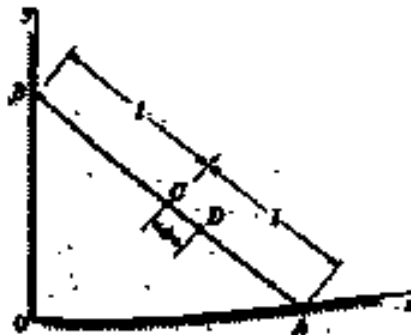


Fig 6

(OR)

10. A system of weights connected by string and passing over the two pulley and B are arranged as shown in Fig.7. Find the acceleration of each weight. Neglect friction and inertia of pulleys. Given  $P=30\text{ N}$ ,  $Q=20\text{ N}$  and  $R=10\text{ N}$ .

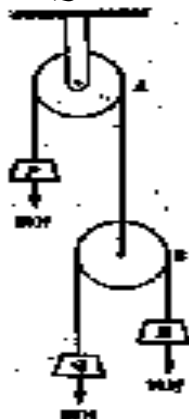


Fig 7

Answer ONE question from each unit

All questions carry equal marks

All parts of the Questions must be answered at one place

UNIT-I

1. a) Explain the different types of supports with neat sketches. 4 M
- b) A sphere of radius 5 cm, and of weight 120 N is supported on a smooth wall by a tie rod of length 13 cm, as shown in Fig.1. Find the tension in the tie rod and reaction at point of contact C. 10 M

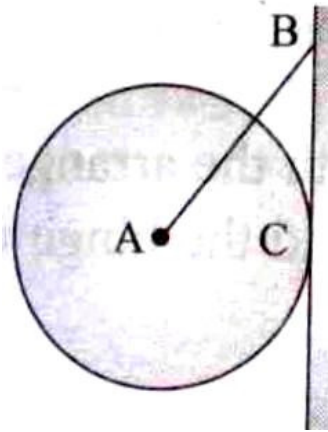
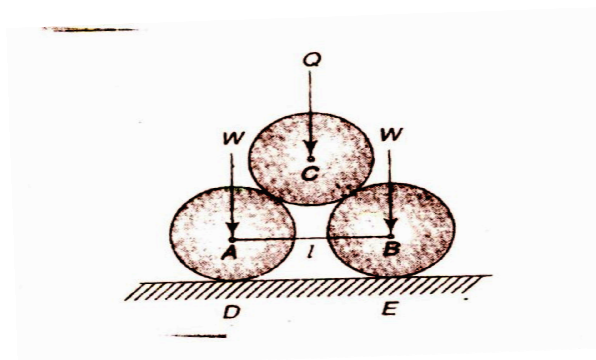


Fig.1

(OR)

- 2) Two smooth circular cylinders, each of weight  $W=445\text{N}$ , and radius  $r=152\text{ mm}$  are connected at their centres by a string AB of length  $l=406\text{ mm}$  and up on a horizontal plane, supporting above them a third cylinder of weight  $Q=890\text{N}$  and radius  $r=152\text{ mm}$  as shown in Fig. 2. Find the force in the string and reactions induced at the points of contacts D and E. 14 M



## UNIT-II

3. a) How can you resolve a force into a force and couple? Where it is useful? 4 M

b) In a spanner wrench, as shown in Fig.3. a force of 250 N is applied at the handle. How much force will be exerted on the cylinder at M and N? Consider the radius of cylinder to be 7 cm. 10 M

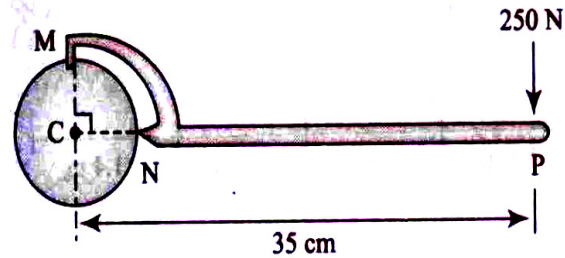


Fig.3

(OR)

4. a) State laws of dry friction. 4 M

b) A rigid bar is subjected to a system of parallel forces as shown in Fig.4. Reduce this system to i) a single force ii) a single force and couple at A iii) a single force and couple at B. 10 M

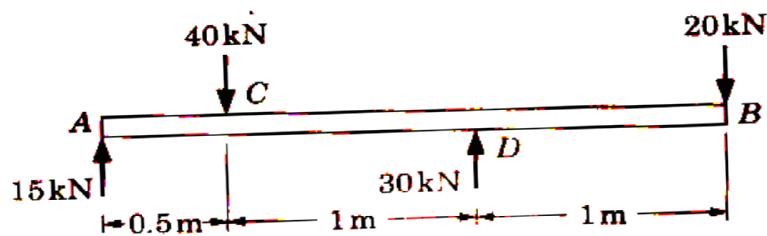


Fig.4

## UNIT-III

5 a) Determine by integration, the coordinates of the centroid of the area of the quarter circle of radius  $r$ . 4 M

b) Referring to Fig.5, determine the coordinates of the centre of a 100 mm diameter, circular hole cut in a thin plate so that this point will be the centroid of the remaining shaded area 10 M



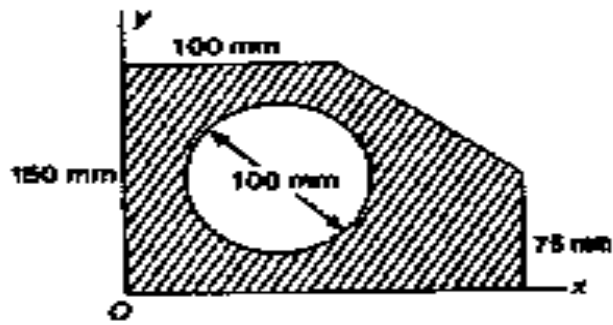


Fig.5

(OR)

- 6 a) Find the second moment of area of a rectangle having dimensions  $a$  and  $b$  with respect to a diagonal. 4 M
- b) Find the moment of inertia about the centroidal axes of the plane area (Z-Section) shown in Fig.6 10 M

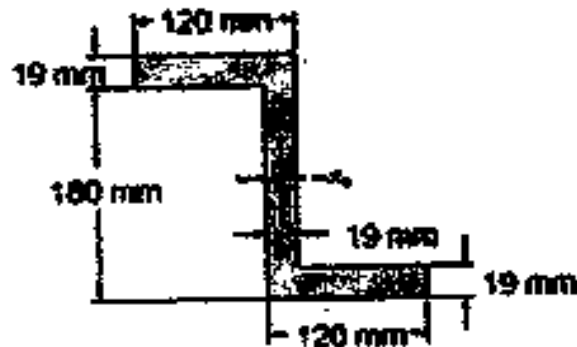


Fig.6

#### UNIT-IV

7. Using method of joints, find the axial force in each of the bars 1,2,3, 4 and 5 of the plane truss supported and loaded as shown in Fig.7 14 M

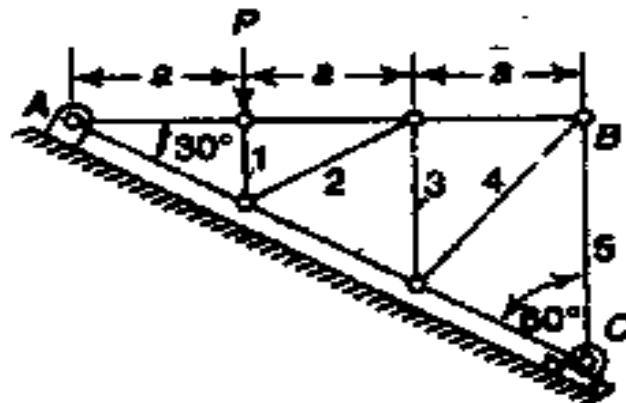


Fig.7

(OR)

8 a) When do you think method of sections is preferable over method of joints ? 3M

b) Using method of sections, find the axial force in each of the bars 1, 2, 3 of the plane truss in Fig.8 11 M

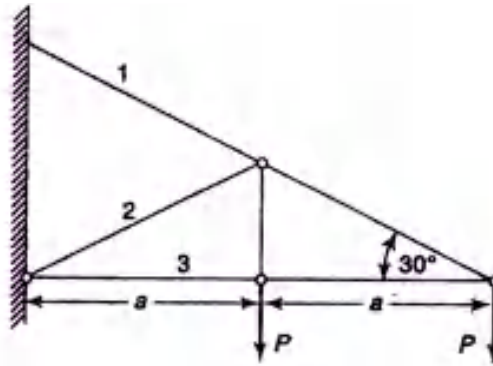


Fig.8

### UNIT-V

9 a) State and explain the principle of virtual work. 4 M

b) Using principle of virtual work, find the reactions at C and F of the assembly loaded as shown in Fig.9 10 M

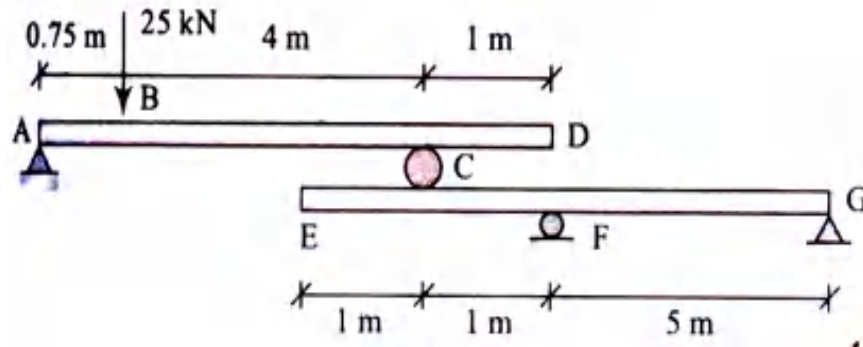


Fig.9

(OR)

10 a) Explain the terms virtual displacement and virtual work. 4 M

b) Using principle of virtual work, find the horizontal and vertical components of the reactions at A and B of the frame loaded as shown in Fig.10. The bars form three equal squares. 10 M

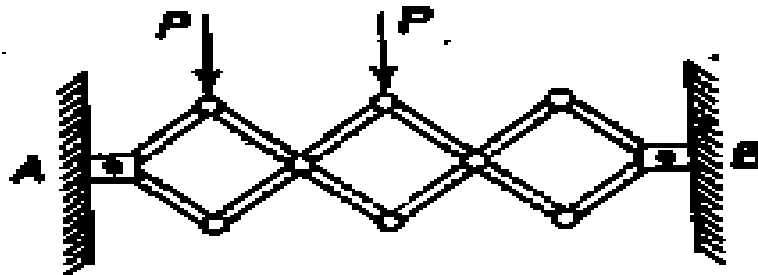


Fig 10

**Time: 3 Hours****Max Marks: 70**

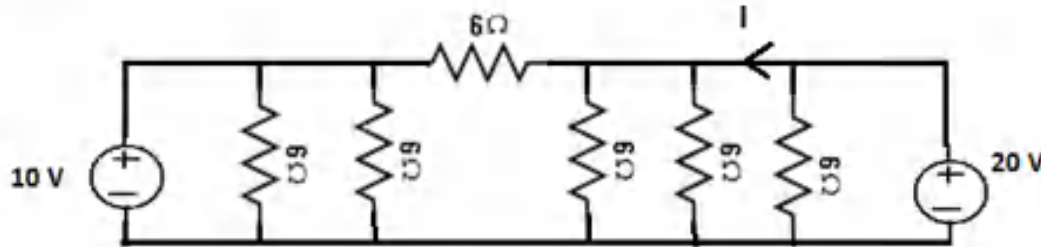
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. a Consider a source of voltage  $v(t) = 10\sqrt{2} \sin 2t$  V, with an internal resistance of  $1800 \Omega$ . A transformer that can be considered ideal is used to couple a  $50\Omega$  resistive load to the source. 7M
- (i) Determine the primary to secondary turns ratio of the transformer required to ensure maximum power transfer by matching the load and source resistances. (ii) Find the average power delivered to the load.
- b Determine current 'I' as shown in the figure below 7M

**(OR)**

2. a State and explain KVL and KCL 6M
- b A circuit consists of three resistances of 12, 18 and 36 ohms respectively by 8M  
joined in parallel and the combination is connected in series with a  
resistance of 12 ohms. The whole circuit is connected to 60V supply.  
Calculate current in each branch, total current drawn and power dissipated  
in each resistor

**UNIT-II**

3. a Draw the circuit diagram of DC series generator and write the relations 7M  
between voltages and currents? Write its applications.
- b A DC series motor is driving a fan load, whose torque varies a cube of 7M  
speed. The total armature and series field resistance is 1 ohm. It takes  
10 A from 200 V mains and runs at 1000 rpm. Find the resistance to be  
connected in series with the motor to make it run at 800 r.p.m.

**(OR)**

4. a A d.c shunt motor runs at a speed of 1000 r.p.m. on no load taking a 7M  
current of 6 A from the supply, when connected to 220 V d.c. supply.  
Its full load current is 50 A. Calculate its speed on full load. Assume  
 $R_e = 0.3 \Omega$  and  $R_{sh} = 110 \Omega$ .

- b A long shunt compound generator delivers a load current of 30A at 400V and has armature, series field and shunt field resistances of  $0.04\ \Omega$ ,  $0.02\ \Omega$  and  $180\ \Omega$  respectively. Calculate the generated voltage and the armature current. Allow 1V per brush for contact drop. 7M

### UNIT-III

5. a Explain principle of operation of a Single phase transformer? 7M  
 b A 250/125 V, 5 kVA single phase transformer has primary resistance of  $0.2\ \Omega$  and reactance of  $0.75\ \Omega$ . The secondary resistance is  $0.05\ \Omega$  and reactance of  $0.2\ \Omega$  7M  
 i) Determine its regulation while supplying full load on 0.8 leading p.f.  
 ii) The secondary terminal voltage on full load and 0.8 leading p.f.

(OR)

6. a What are the losses that are occur in a transformer? Explain the methods to minimize losses. 7M  
 b A 400 kVA, distribution transformer has full load iron loss of 2.5kW and copper loss of 3.5kW. During a day, its load cycle for 24 hours is, 6 hours 300kW at 0.8 p.f.  
 10 hours 200kW at 0.7 p.f.  
 4 hours 100 kW at 0.9 p.f.  
 4 hours No load  
 Determine its all day efficiency. 7M

### UNIT-IV

7. a Explain the synchronous impedance method for determine regulation of an alternator? 7M  
 b Draw the phasor diagram and establish the relationship between induced e.m.f. and the terminal voltage for a three phase alternator for lagging, leading and unity power factor load. 7M  
 (OR)  
 8. a Explain principle operation of Moving Iron instruments and explain their advantages & disadvantages? 7M  
 b Find the number of armature conductors in series per phase required for 3 phase, 10 pole alternator when driven at a speed of 600 r.p.m. armature has 90 slots and armature winding is star connected to give induced e.m.f. of 11kV between the lines. Assume flux per pole as 16mWb. 7M

### UNIT-V

9. a Explain the rectifying action of the P-N junction diode with circuit diagram and wave forms 7M  
 b A full wave rectifier circuit is fed from a transformer having a center-tapped secondary winding. The r.m.s. voltage from either end of secondary to center tap is 30 V. If the diode forward resistance is  $2\ \Omega$  and that of the half secondary is  $8\ \Omega$ , for a load of  $1k\ \Omega$ , calculate, 7M  
 i) Power delivered to load ii) % Regulation at full load  
 iii) Efficiency of rectification iv) T.U.F. of secondary.

(OR)

10. a Draw and explain input and output characteristics of a transistor CB configuration 7M  
 b Differentiate between NPN and PNP junction transistors 7M

# AR13

CODE: 13BS1002

SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, November-2018

ENGINEERING MATHEMATICS-II

(Common to CIVIL, MECH, CSE, IT)

Time: 3 Hours

Max Marks: 70

## PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) State intermediate value theorem
- b) Find the value of a if  $y = ax + b$  and the normal equations are  $15a + 5b = 204$ ,  $55a + 15b = 748$
- c) Find  $(1 + \Delta)(1 - \nabla)$
- d) Geometrically the Lagrange's interpolation formula for two points of interpolation represents
- e) If  $y_0 = 1$ ,  $h = 0.2$ ,  $f(x_0, y_0) = 1$  by Euler's method find  $y_1$
- f) If  $y' = xy + y^2$ ,  $y(0) = 1$ ,  $h = 0.1$  then the value of  $k_1$  in Runge Kutta fourth order formula is
- g) Write the change of scale property of Laplace transforms
- h) Find the inverse Laplace transform of  $\frac{1}{(s-2)(s-3)}$
- i) Solve  $z = px + qy - 2\sqrt{pq}$
- j) Find the general solution of  $p + q = 1$

## PART-B

Answer one question from each unit

[5x12=60M]

### UNIT-I

2. a) Assuming that a root of  $x^3 - 9x + 1 = 0$  lies in (2,4), find that root by bisection method correct up to two decimal places. [6 M]
  - b) Solve  $x^3 = 2x + 5$  for a positive root by iteration method. [6 M]
- (OR)
3. a) Find the smallest positive root of  $x^3 - 5x + 3 = 0$  using Newton Raphson method. [6 M]
  - b) Fit a least square curve of the form  $y = a e^{bx}$  for the data [6 M]
- |    |      |      |      |      |
|----|------|------|------|------|
| x: | 1    | 2    | 3    | 4    |
| y: | 1.65 | 2.70 | 4.50 | 7.35 |

### UNIT-II

4. a) Using Newton forward difference formula estimate  $y(0.12)$  from the following data [6 M]
- |    |       |       |       |       |       |
|----|-------|-------|-------|-------|-------|
| x: | 0.10  | 0.15  | 0.20  | 0.25  | 0.30  |
| y: | 0.650 | 0.522 | 0.410 | 0.316 | 0.240 |

- b) For the following data fit a polynomial by Newton backward difference formula [6 M]
- |    |   |   |    |    |
|----|---|---|----|----|
| x: | 1 | 2 | 3  | 4  |
| y: | 2 | 5 | 16 | 41 |

(OR)

5. a) Find the Lagrange's interpolating polynomial and using it find y when x = 10, if x and y are given as follows: [6 M]
- |    |    |    |    |    |
|----|----|----|----|----|
| x: | 5  | 6  | 9  | 11 |
| y: | 12 | 13 | 14 | 16 |
- b) Evaluate  $\int_0^2 e^{-x^2} dx$  using Simpson's 1/3 rule by taking h = 0.25 [6 M]

### UNIT-III

6. a) Using Taylor's series method, solve  $\frac{dy}{dx} = xy$ ,  $y(0) = 2$  to find  $y(0.2)$ . [6 M]
- b) Solve  $\frac{dy}{dx} = x + y$  subject to  $y(0) = 1$  by Picard's method and hence find  $y(0.2)$ . [6 M]
- (OR)
7. Find  $y(0.1)$  and  $y(0.2)$  using Runge – Kutta fourth order formula given that  $\frac{dy}{dx} = x^2 - y$  and  $y(0) = 1$  [12M]

### UNIT-IV

8. a) Find the Laplace transform of  $\frac{\cos at - \cos bt}{t}$  [6 M]
- b) Find the Laplace transform of  $te^{2t} \sin 3t$  [6 M]
- (OR)
9. a) Find the inverse Laplace transform of  $\frac{3s-2}{s^2-4s+20}$  [6 M]
- b) Using convolution theorem find  $L^{-1} \left\{ \frac{1}{s(s^2+4)} \right\}$  [6 M]

### UNIT-V

10. a) Form the partial differential equation by eliminating the arbitrary function f from  $z = xy + f(x^2 + y^2)$  [6 M]
- b) Solve  $(y-z)p + (x-y)q = z-x$  [6 M]
- (OR)
11. a) Find the general solution of  $y^2 z p + x^2 z q = y^2 z$  [6 M]
- b) Solve  $z^2 = 1 + p^2 + q^2$  [6 M]

# AR13

CODE: 13ME1003 SET-2  
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, November-2018

## ENGINEERING MECHANICS (Common to EEE & ECE)

Time: 3 Hours

Max Marks: 70

### PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) Define coplanar parallel like force system
- b) What is the statement of Lami's theorem
- c) What is the statement of principle of moments
- d) Compare centre of gravity and centroid
- e) What is the height of centroid of triangle from its base.
- f) State the parallel axis theorem
- g) Define cone of friction
- h) Define angle of repose
- i) Differentiate displacement and velocity
- j) Define curvilinear motion

### PART-B

Answer one question from each unit

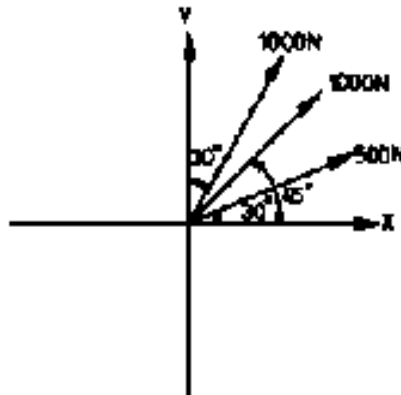
[5x12=60M]

### UNIT-I

2. The resultant of two forces, out of which is double the other is 260 N. If the direction of the larger force is reversed and the other remains unaltered, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between the forces. **12M**

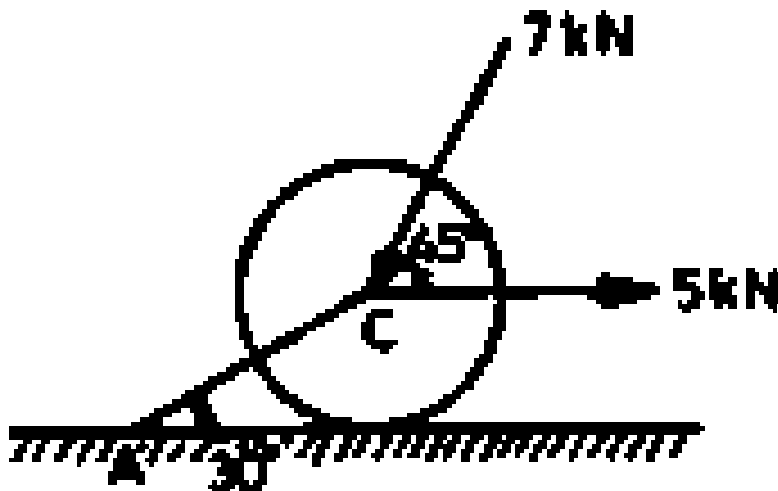
(OR)

3. Three forces acting on a body are 500 N, 1000 N and 1000 N as shown in the figure. Determine the resultant of all the three forces with magnitude and direction. **12M**



### UNIT-II

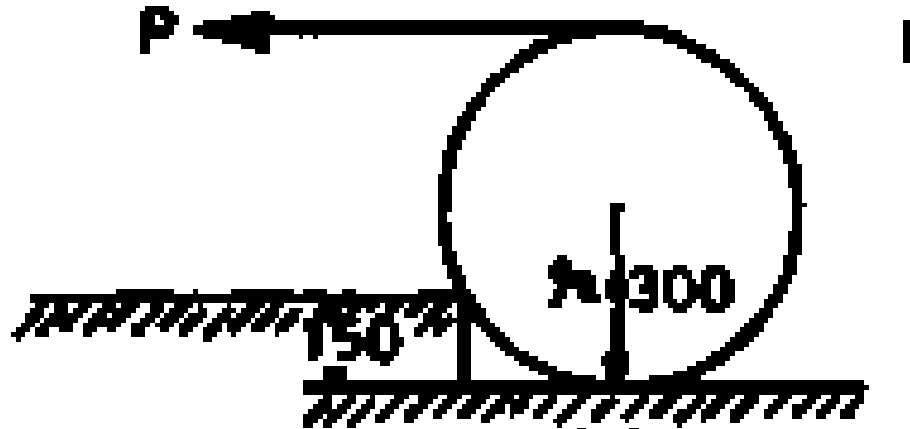
4. A roller of weight 10 kN rests on a smooth horizontal floor and is connected to the floor by the bar AC as shown in below figure. Determine the force in the bar AC and reaction from floor if the roller is subjected to a horizontal force of 5 kN and an inclined force of 7 kN as shown in figure. **12M**



(OR)

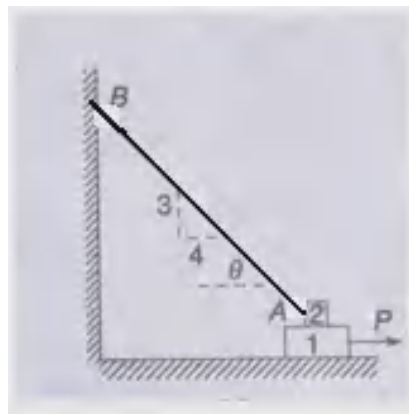


5. A roller of radius  $r=300$  mm and weight  $2000$  N is to be pulled over a curb of height  $150$  mm by a horizontal force  $P$  applied to the end of a string wound tightly around the circumference of the roller. Find the magnitude of  $P$  required to start the roller move over the curb. **12M**



### UNIT-III

6. A block of weight  $W_1 = 900$  N rests on the horizontal surface and supports on top of it, another block of weight  $W_2 = 225$  N. The block  $W_2$  is attached to a vertical wall by the inclined string  $AB$ . Find the magnitude of the horizontal force  $P$  applied to the lower block that will be necessary to cause slipping to impend. Take coefficient of friction for all surfaces as  $0.3$ . **12M**



**(OR)**

7. Determine the centroid of a semicircle by using integration method. **12M**

**UNIT-IV**

8. Determine the moment of inertia of a triangle about its base using integration method **12M**

**(OR)**

9. Find the mass moment of inertia of circular plate of radius  $R$  and thickness  $t$  about its centroidal axis. **12M**

**UNIT-V**

10. A motor car takes 10 seconds to cover 30 meters and 12 seconds to cover 42 meters. Find the uniform acceleration of the car and its velocity at the end of 15 seconds. **12M**

**(OR)**

11. A machine gun of mass 25 kg fires a bullet of mass 30 gram with a velocity of 250 m/s. Find the velocity with which the machine gun will recoil. **12M**