Total No. of Questions : 4]

SEAT No. :

PA-49

[Total No. of Pages : 2

[5931]-77

S.E. (Automobile and Mechanical Engineering/Mechanical Sandwich)

ELECTRICAL AND ELECTRONICS ENGINEERING

(2019 Pattern) (Semester - I) (203156)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Distinguish between a microcontroller and a microprocessor considering memory, speed of operations and flexibility of usage. **[3]**

b) Write any six features on A Tmega 328P microcontroller. **[6]**

c) Explain the following functions used to handle GPIO in ATmega 328P based Arduino board with help of syntax: **[6]**

i) pinMode( )

ii) digitalRead( )

iii) digitalWrite ( )

OR

Q2) a) What is an embedded system? Give any two examples of embedded systems. **[3]**

b) Write any six features of Arduino IDE and explain structure of a program in Arduino. **[6]**

c) Explain the following Arduino functions with the help of appropriate syntax: **[6]**

i) analogRead( )

ii) analogReference( )

iii) analogWrite( )

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Q3) a) Write any three features of ADC in ATmega 328P. **[3]**

b) Draw interfacing diagram of an LED with Arduino board. Also write algorithm and the program to blink the LED for every 1 second interval. **[6]**

c) Explain the following functions used for serial communication in Arduino. **[6]**

i) serial.begin( )

ii) serial.print( )

iii) serial.println( )

OR

Q4) a) Draw interfacing diagram of LCD with ATmega 328P. **[3]**

b) What is LM35? Draw interfacing diagram of LM35 with ATmega 328P. Write algorithm to display temperature on LCD. **[6]**

c) Explain construction and working of LVDT. Draw interfacing diagram of LVDT with ATmega328P. **[6]**

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Total No. of Questions : 4]

SEAT No. :

PA-48

[Total No. of Pages : 2

[5931]-76

S.E. (Automobile &Robotics/Automoble &Mechanical/ Mechanical//Mechanical Sandwich)

ENGINEERING MATERIALS AND METALLURGY

(2019 Pattern) (Semester - I) (202044)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) What is atomic packing factor of unit cell? Calculate atomic packing factor for BCC crystal structure with neat sketch. **[5]**

b) Differentiate between slip and twinning. **[5]**

c) Write a short note on Baushinger effect. **[5]**

OR

Q2) a) Define the term "Miller Indices". Sketch within a cubic unit cell the following planes : **[5]**

i) (111)

ii) (011)

b) State the various point defects in a crystal? Explain any two point defects with the help of diagram. **[5]**

c) Differentiate between ductile fracture and brittle fracture. **[5]**

Q3) a) Write short note on Poldi hardness test. **[5]**

b) With a neat diagram explain the principle of Scanning Electron Microscope (SEM). Also state the application of it. **[5]**

c) Differentiate between microscopic and macroscopic examination. **[5]**

OR

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Q4) a) Differentiate between Charpy and Izod impact test. **[5]**

b) Explain the principle of Eddy current test with a neat sketch and state the application of it. **[5]**

c) Write short note on Spark test. **[5]**

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Total No. of Questions : 9]

SEAT No. :

PA-1285

[Total No. of Pages : 4

[5925]-311

S.E. (Automobile & Mechanical/Automation & Robotics/ Mechatronics /Mechanical /Mechanical Sandwich)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - IV) (207002)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Question No. 1 is compulsory. Solve Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) The first four moments of a distribution about mean of the variable are 0, 2, 0 and 11. Then β_2 = **[2]**

i) 2.5 ii) 2.3999

iii) 2.75 iv) 0.5987

b) If $\overline{F} = (x^2 y)\hat{i} + (xyz)\hat{j} + (z^2 y)\hat{k}$ then curl $\overline{F}$ at (1, 1, 2) is **[2]**

i) $5\hat{i} + \hat{j}$ ii) $3\hat{i} + \hat{j} + \hat{k}$

iii) $3\hat{i} + \hat{k}$ iv) $3\hat{i} + \hat{j}$

c) The most general solution of the partial differential equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ representing heat flow along a bar is **[2]**

i) $(c_1 \cos mx + c_2 \sin mx)e^{-c^2 m^2 t}$

ii) $(c_1 \cos mx + c_2 \sin mx)e^{-m^2 t}$

iii) $(c_1 \cos mx + c_2 \sin mx)(c_3 \cos cmt + c_4 \sin cmt)$

iv) $(c_1 \cos mx + c_2 \sin mx)(c_3 e^{my} + c_4 e^{-my})$

d) In Binomial probability distribution, if $p = q$, then $P(\overline{X} = r)$ is **[2]**

i) ${}^n c_r \left(\frac{1}{2}\right)^{n-r}$ ii) ${}^n c_1 \left(\frac{1}{2}\right)^n$

iii) ${}^n c_r \left(\frac{1}{2}\right)^n$ iv) ${}^n c_n \left(\frac{1}{2}\right)^n$

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e) If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $\nabla \cdot \bar{r} =$ **[1]**

i) 1 ii) 2
iii) 3 iv) 4

f) In a poisson distribution if $P(r=3) = 6P(r=4)$, then $P(r=2)$ is equal to **[1]**

i) 0.025 ii) 0.01148
iii) 0.251 iv) 0.1148

Q2) a) Fit a straight line of the Form $y = ax + b$ to the following data. **[5]**

x	1	3	4	5	6	8
y	–3	1	3	5	7	11

b) Calculate the first four moments about the mean of the following distribution. **[5]**

x	1	2	3	4	5	6	7	8	9	10
F	6	15	23	42	62	60	40	24	13	5

c) Find the coefficient of correlation for the following table. **[5]**

x	10	14	18	22	26	30
y	18	12	24	6	30	36

OR

Q3) a) Fit a straight line to the following data. **[5]**

x	0	5	10	15	20	25
y	12	15	17	22	24	30

b) First four moments of a distribution about value 4 are –1.5, 17, –30 and 108. Find the first four moments about mean β_1 & β_2. **[5]**

c) Obtain the regression lines for the following table. **[5]**

x	6	2	10	4	8
y	9	11	5	8	7

Q4) a) From 20 tickets marked 1 to 20, one ticket is drawn at random. Find the probability that it is marked with multiple of 3 or 5. **[5]**

b) A fair coin is tossed 6 times. Find a probability of getting: **[5]**

i) at least four heads
ii) not heads

c) Assuming that the distance of 1000 brass plugs taken consecutively from machine from a normal distribution with mean 0.7515 cm and standard deviation 0.0020 cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004 cm. (Given Area = 0.478 for $z = 2.25$ and Area 0.4599 for $z = 1.75$). **[5]**

OR

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Q5) a) A can hit the target 1 out of 4 times. B can hit 2 out of 3 times. C can hit the target 3 out of 4 times. Find the probability that at least 2 hit the target. **[5]**

b) In a certain factory turning out razor blades there is a small chance of $\frac{1}{500}$ for any blade to be defective. The blades are supplied in a pack of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective and two defective blades, in a consignment of 10,000 packets. **[5]**

c) Among 64 off spring of a certain cross between European horses, 34 were red, 10 were black and 20 were white. According to a genetic model, these numbers should be in the ratio 9 : 3 : 4. Is the data consistant with the model at 5% level of significance $\left(\chi^2_{v-1,0.05} = 5.99\right)$. **[5]**

Q6) a) Find the directional derivative of $\phi = x^2 - y^2 - 2z^2$ at the point $P(2,-1,3)$, in the direction PQ where Q is (5, 6, 4). **[5]**

b) Show that the vector field $\bar{F} = \left(8xy + z^4\right)\bar{i} + \left(4x^2 - z\right)\bar{j} + \left(4xz^3 - y\right)\bar{k}$ is irrotational. Find Scalar potential function ϕ such that $\bar{F} = \nabla\phi$. **[5]**

c) Using Green's theorem for $\bar{F} = xy\bar{i} + y^2\bar{j}$ over region R enclosed by parabola $y = x^2$ and line $y = x$ in the first quadrant, evaluate $\int_c xy\,dx + y^2 dy$. **[5]**

OR

Q7) a) Using Stoke's theorem evaluate $\iint_s \nabla \times \bar{F} \cdot \hat{N}\,ds$ where $\bar{F} = 3y\bar{i} - xz^2\bar{j} + yz^2\bar{k}$ and s is surface of the paraboloid $2z = x^2 + y^2$ bounded by $z = 2$. **[5]**

b) Prove that (any one): **[5]**

i) $\bar{b} \times \left(\nabla\left(\bar{a} \cdot \nabla \log r\right)\right) = \frac{\bar{b} \times \bar{a}}{r^2} - \frac{2\left(\bar{a} \cdot \bar{r}\right)}{r^4}\left(\bar{b} \times \bar{r}\right)$

ii) $\nabla^4\left(r^2 \log r\right) = \frac{6}{r^2}$

c) Find angle between the tangents to the curve $\bar{r} = t^2\bar{i} + 2t\bar{j} - t^3\bar{k}$ at the points $t = 1$ and $t = -1$. **[5]**

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Q8) a) A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is **[8]**

$$u(x,0) = x, \qquad 0 \le x \le 50,$$
$$= 100 - x, \quad 50 \le x \le 100.$$

Find the temperature $u(x,y)$ at any time.

b) Solve following $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ subject to **[7]**

i) $y(0,t) = 0, \forall t$

ii) $y(l,t) = 0, \forall t$

iii) $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$

iv) $y(x,0) = \frac{3a}{2l}x, \qquad 0 \le x \le \frac{2l}{3}$

$$= \frac{3a}{l}(l - x), \ \frac{2l}{3} \le x \le l$$

OR

Q9) a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to **[8]**

i) $u = 0$ when $y \to \infty$ for all x

ii) $u = 0$ when $x = 0$ for all y

iii) $u = 0$ when $x = l$ for all y

iv) $u = x(1 - x)$ when $y = 0$ for $0 < x < 1$.

b) The initial temperature along the length of an infinite bar is given by

$u(x,0) = 2, \quad |x| < 1$
$= 0, \quad |x| > 1$. If the temperature $u(x,t)$ satisfies the equation

$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, -\infty < x < \infty, t > 0,$ find the temperature at any point of the bar at time t. **[7]**

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Total No. of Questions : 4]

SEAT No. :

PA-439

[Total No. of Pages : 2

[5931]-75

S.E. (Automobile & Mechanical/Mechanical(Sandwich))

ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - I) (202043)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***use of electronic pocket calculator is allowed.***
5) ***Assume suitable data; if necessary.***

Q1) a) Distinguish between : **[8]**

i) Intensive and Extensive properties.
ii) Process and cycles
iii) Open system and closed system

b) A closed vessel contains 2 kg of carbon dioxide at temperature 20ºC and pressure 0.7 bar. Heat is supplied to the vessel till the gas acquires a pressure of 1.4 bar. **[7]**

Calculate :

i) Final temperature
ii) Work done on or by the gas
iii) heat added
iv) Change in internal energy. Take specific heat of gas at constant volume as 0.657 kJ/kg-K.

OR

Q2) a) Prove that the ratio of specific heats at constant pressure to constant volume is equal to adiabatic index γ. **[7]**

b) With sketch write down the application of Steady Flow energy equation to : **[8]**

i) Nozzle ii) Boiler
iii) Turbine iv) Pump

P.T.O.

Q3) a) A domestic food freezer maintains a temperature of –15ºC. The ambient temperature is 30º C. If heat leaks into the freezer at continuous rate of 1.75 kJ/s. What is the least power necessary to pump this heat out continuously. **[5]**

b) Define specific heats at constant volume and at constant pressure. **[2]**

c) Draw P-V and T-S diagrams of : **[8]**

i) Constant volume

ii) Isothermal

iii) Adiabatic

iv) Constant Pressure

OR

Q4) a) State the limitation of first law of thermodynamics. **[2]**

b) Explain the concept of reversibility and irreversibility. **[6]**

c) Explain with neat diagram Carnot cycle write the efficiency of Carnot cycle. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PA-1318

[Total No. of Pages : 3

[5925]-351

S.E. (Automobile & Mechanical Engg.)

FLUID MECHANICS

(2019 Pattern) (Semester - IV) (202049)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

Q1) a) Define following terms : **[4]**

i) Path line ii) Stream line

iii) Streak line iv) Stream tube

b) Distinguish between : **[6]**

i) Uniform & Non uniform flow

ii) Steady & Unsteady flow

iii) Rotational & Irrotational flow

c) The velocity potential function is given by $\phi = (x^2 - y^2)$ find the velocity vector for the given fluid flow. Also show that ϕ represents possible case of flow. **[7]**

OR

Q2) a) Explain following properties with their mathematical properties : **[4]**

i) Velocity potential

ii) Stream function

b) Derive continuity equation for 1D flow along streamline. **[6]**

c) The velocity vector in the fluid flow is given by $V = 2x^3\hat{i} - 5x^2y\hat{j} + 2t\hat{k}$. Obtain velocity & acceleration at point (2, 1, 0) at time t = 1s. **[7]**

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Q3) a) Differentiate between venturimeter & orificemeter. **[4]**

b) State & Derive Bernoulli's equation along streamline. **[6]**

c) An oil of specific gravity 0.9 & viscosity 10 poise is flowing through a pipe of diameter 110mm. The velocity at the center of pipe is 2m/s find : **[8]**

i) The pressure gradient in the direction of flow.

ii) Shear stress at the pipe wall

iii) Velocity at a distance 30mm from pipe wall

OR

Q4) a) Show that the value of coefficient of friction for viscous flow through the circular pipe is given by $f = 16/Re$. **[4]**

b) Derive an expression of velocity & shear stress distribution for laminar flow through pipe. **[6]**

c) A conical tube of length 3m is fixed vertically with its smaller end upwards. The velocity of flow at smaller end is 4m/s; while at its lower end is 2m/s. The pressure head at the smaller end is 2m of liquid. The loss of head through the pipe is $0.95 (v_1 - v_2)^2/2g$ where v_1 velocity at smaller end & v_2 velocity at lower end. Determine the pressure head at the lower end. Flow takes place in downward direction. **[8]**

Q5) a) Explain the following term with their graphical representation : **[4]**

i) Hydraulic Grade line

ii) Total Energy line

b) What is siphon? Explain its working along with the diagram? **[6]**

c) Find the displacement thickness, the momentum thickness for the velocity distribution in the boundary layer is given by

$$\frac{u}{v} = 2\left(y/\delta\right).\left(y/\delta\right)^2 .$$ **[8]**

OR

Q6) a) Define the following term with brief explanations : **[4]**

i) Boundary layer

ii) Boundary layer thickness

iii) Drag

iv) Lift

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b) What do you mean by Boundary layer separation? Write the methods of preventing the separation of boundary layer. **[6]**

c) A pipe of diameter of 0.4m and length 2000 m is connected to a reservoir at one end. The other end of the pipe is connected to a junction from which two pipes of lengths 1000m and diameter 3000m are parallel. These parallel pipes are connected to another reservoir, which is having level of water 10m below the water level of the above reservoir. Determine the total discharge if $f = 0.015$. Neglect minor losses. **[8]**

Q7) a) State and explain Buckingham's π-theorem. What do you mean by repeating variables? How are repeating variables selected in Dimensional Analysis? **[8]**

b) The Frictional Torque of disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by

$$T = D^5 N^2 \rho \phi \left[\frac{\mu}{D^2 N \rho}\right].$$ **[9]**

OR

Q8) a) Explain the following Dimensionless number along with mathematical expressions : **[8]**

i) Reynolds Number

ii) Froude's Number

iii) Euler's Number

iv) Weber Number

b) A Fluid of density ρ, and viscosity μ, flows at a velocity v through a circular pipe of diameter D. By using Buckingham's π-theorem. Prove that shear stress τ_0 at wall is given by $\tau_0 = \rho v^2 \phi \left[\frac{\rho v D}{\mu}\right]$. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PA-1282

[Total No. of Pages : 4

[5925]-307

S.E. (Automobile & Mechanical/Mechanical/ Mechanical Sandwich/Automation & Robotics)

KINEMATICS OF MACHINERY

(2019 Pattern) (Semester - IV) (202047)

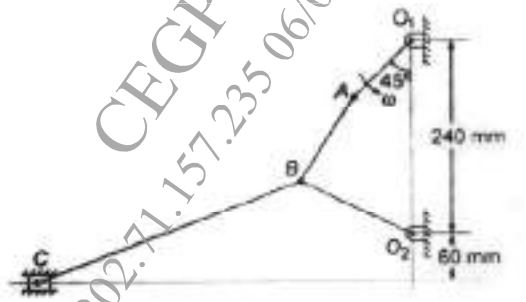
Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Use of calculator is allowed.*
5) *Assume suitable data if necessary.*

Q1) a) Explain with neat sketch Kennedy's theorem. **[5]**

b) In the mechanism shown in Fig. determine the acceleration fo the slider C. O_1A = 100mm, AB = 120mm, O2B = 150mm, and BC = 350mm. The crank O_1A rotates at 240rpm. **[13]**



OR

Q2) a) Explain coriolis acceleration with neat sketch. **[5]**

b) Fig shows a six link mechanism. The dimensions of links are OA = 100 mm, AB = 580 mm, BC = 300 mm, QC = 100 mm and CD = 350 mm. The crank OA rotates at 150rpm. For the position when crank OA makes an angle of 30º with the horizontal determine by using ICR method, Total no. of links are 6. **[13]**

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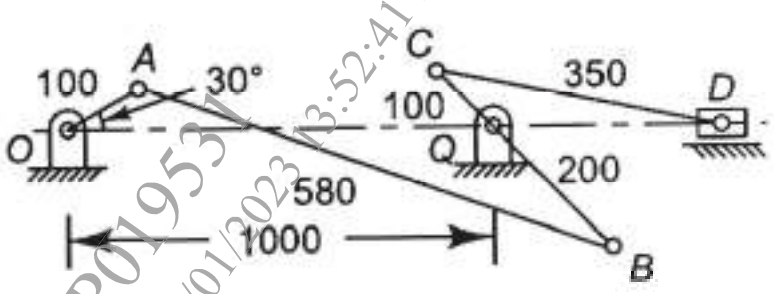
i) Linear velocity of points B, C and D.

ii) Angular velocity of links AB, BC and CD.



Q3) a) Explain the following terms : **[6]**

i) Type synthesis

ii) Number synthesis

iii) Dimensional synthesis

b) Determine the Chebyshev spacing for the function $y = x^{1.5}$ for the range $1 \leq \times \leq 3$ where three precision points are required. For these points, determine θ_2, θ_3 & ϕ_2, ϕ_3 if $\Delta\theta = 400$ & $\Delta\phi = 900$. **[11]**

OR

Q4) a) Explain the following terms : **[6]**

i) Function generation

ii) Path generation

iii) Motion generation

b) Design a four bar mechanism with input link l_2, coupler link l_3 & output link l_4, Angles θ & φ for 3 successive positions are given below : **[11]**

Position	1	2	3
θ	40º	55º	70º
φ	50º	60º	75º

If grounded link l = 30mm using Freudenstein's equation, find out lenghts of other links to satify given positional conditions. Also draw synthesize mechanism in its first position & comment on the mechanism obtained.

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Q5) a) What do you mean by interference and undercut? **[7]**

Define :

i) Helix angle

ii) Transverse circular pitch

iii) Transverse module

b) A pair of spur gears with involute teeth is to a gear ratio of 4 : 1. The arc of approach is not to be less than the circular pitch and smaller wheel is the driver. The angle of pressure is 14.5º. **[11]**

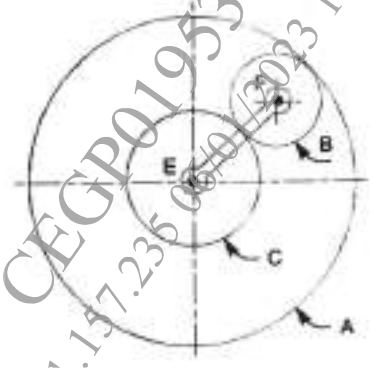
Find : i) the least number of teeth that can be used on each wheel and

ii) the addendum of the wheel in terms of the circular pitch?

OR

Q6) a) What do you understand by 'gear train'? Discuss the various types of gear trains. **[4]**

b) An epicyclic gear consists of three gears A, B and C as shown in Fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m. If the gear A is fixed, determine the speed of gears B anc C. **[14]**



Q7) a) What are the various types of automation? Explain them. **[5]**

b) A cam is to be designed for a knife edge follower with the following data : **[12]**

i) Cam lift = 40 mm during 90º of cam rotation with simple harmonic motion.

ii) Dwell for the next 30º.

iii) During the next 60º of cam rotation, the follower returns to its original position with simple harmonic motion.

iv) Dwell during the remining 180º.

The radius of the base circle of the cam is 40 mm.

Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft.

OR

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Q8) a) What are the benefits of automated production lines? **[5]**

b) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion as described below. **[12]**

i) To raise the valve through 50mm during 120º rotation of the cam;

ii) To keep the valve fully raised through next 30º;

iii) To lower the valve during next 60º; and

iv) To keep the valve closed during rest of the revolution i.e. 150º;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft.

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Total No. of Questions : 8]

SEAT No. :

PA-2632

[Total No. of Pages : 3

[5925]- 310

S.E. (Automation&Robotics/Mechanical/Automobil & Mechanical)

MANUFACTURING PROCESSES

(2019 Pattern) (Semester - IV) (202050)

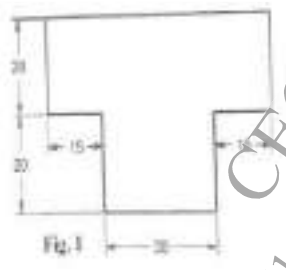
Time :2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***All questions are compulsory i.e. solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain with neat sketch any two sheet metal operations. **[8]**

b) What is centre of pressure? Write a detailed procedure for centre of pressure. Also Find centre of pressure of component shown in fig. 1 is to be made from mild steel sheet of 1.7 mm thick. **[10]**



OR

Q2) a) Explain compound and progressive sheet metal dies. **[8]**

b) A part shown in fig. 2 is to be made from sheet of 3 mm thick and ultimate shear strength of material is 30 N/mm². **[10]**

Determine:

i) Stock Strip layout

ii) % utilization of stripi

iii) Clearance between punch and die.

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iv) Blanking force,

v) Sectional view of press.

Q3) a) What is coating on an arc welding electrode, with advantages. **[6]**

b) Explain principle of TIG welding with advantages. **[6]**

c) Explalin in detail type of joints used in welding. **[5]**

OR

Q4) a) Compare between Spot and Seam weld process. **[6]**

b) Compare between Soldering and brazing process. **[6]**

c) Explain any five defects in welding process. **[5]**

Q5) a) Defferentiate between thermoplastics and Thermosetting plastics. **[6]**

b) Explain with figure injection molding process. **[6]**

c) Explain in detail extrusion of pipe and extrusion of sheets. **[6]**

OR

Q6) a) Explain with figure blow molding process. **[6]**

b) Explain in detail vacuum forming process. **[6]**

c) Write short notes on pressure forming process. **[6]**

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Q7) a) Explain with figure Spray lay-up process. **[6]**

b) Explain with figure vacuum impregnation process. **[6]**

c) Write short notes on nano-composites. **[5]**

OR

Q8) a) Explain with figure Hand lay-up Process. **[6]**

b) Explain with figure Fabrication of ceramic matrix composites. **[6]**

c) Write short notes on Filament winding process. **[5]**

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S.E. (Automobile & Mechanical Engineering/Mechanical Sandwitch/Automation & Robotics)

SOLID MECHANICS

(2019 Pattern) (Semester - I) (202041)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) A 2.0 m long steel bar is having uniform diameter of 40 mm for a length of 1 m from one end. For the next 0.5 m length the diameter decreases uniformly to '*d*'. For the remaining 0.5 m length it has a uniform diameter of d mm. When a load of 150 *k* N is applied, the observed extension is 2.40 mm. Determine the diameter *d*. Take modulus of elasticity for steel equal to 200 *k* N/mm^2. **[7]**

b) The composite bar consisting of steel and aluminium components as shown in Fig 1.1 is connected to two grips at the ends at a temperature of 60º C. Find the stresses in the two rods when the temperature falls to 20ºC. **[8]**

i) if the ends do not yield.

ii) if the ends yield by 0.25 mm.

Take $E_s = 2 \times 10^5$ and $E_a = 0.7 \times 10^5$ N/mm^2, $\alpha_s = 1.17 \times 10^{-5}$ and $\alpha_a = 2.34 \times 10^{-5}$ per °C. The areas of steel and aluminium bars are 250 mm^2 and 375mm^2 respectively.

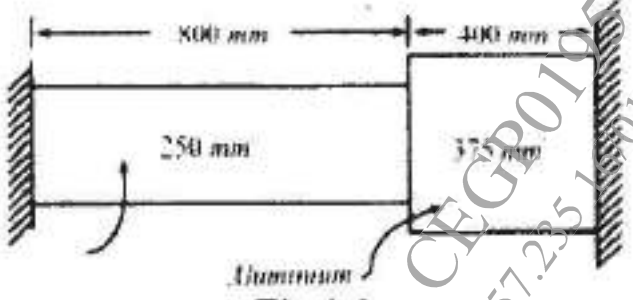

Fig 1.1

OR

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Q2) a) A steel block 360mm×80mm×160 mm is subjected to the following forces. **[7]**

i) A tensile force of 1280KN on the 160mm×80mm faces (take as a X - direction).

ii) A tensile force 3456 KN the 360mm×80mm faces (take as a Y - direction) and.

iii) A compressive force of 5184KN on the 160mm×360mm faces (take as a Z - direction).

Find the changes in the dimensions of the block and also the change in volume. Take E = 2×10^5 N/mm^2 and 1/m = 0.25.

b) A rigid rod ABCD is supported by a hinge at A and two wires at B and C as shown in figure 2.1. Determine the stresses and elongation of the two wires. Take E_s = 200 GPa and E_c =100GPa. **[8]**

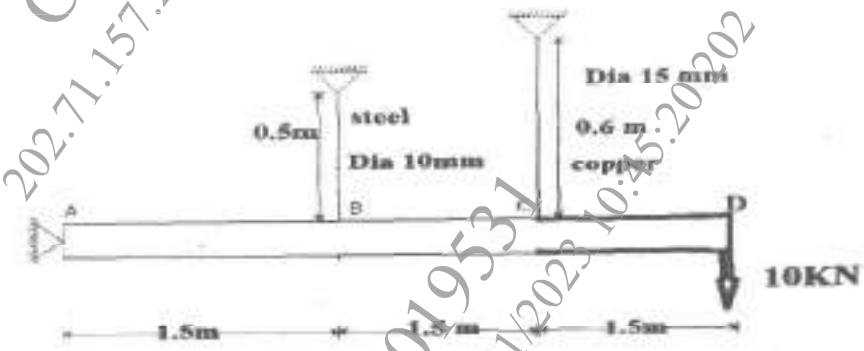

Fig 2.1

Q3) a) Draw SFD and BMD of the beam shown in figure 3.1 **[7]**

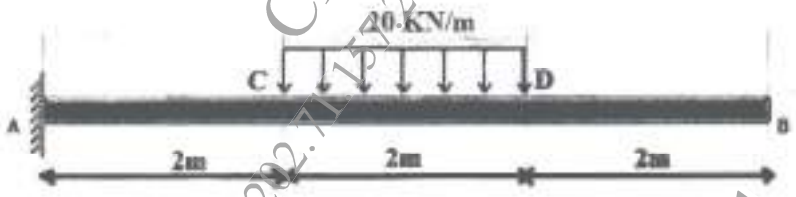

Fig 3.1

b) Draw SFD & BMD of the beam shown in figure 3.2, also locate the point of contraflexure from left end. **[8]**

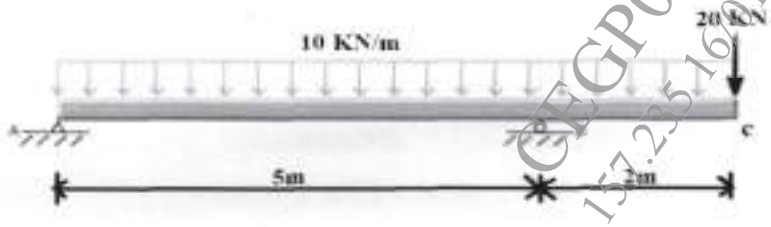

Fig 3.2

OR

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Q4) a) Draw SFD & BMD of the beam shown in figure 4.1. **[7]**

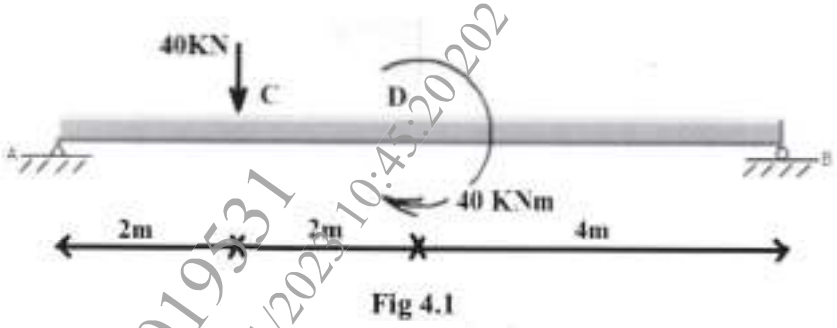

Fig 4.1

b) Draw SFD & BMD, of the beam shown in figure 4.2, also find the POC from left end. **[8]**

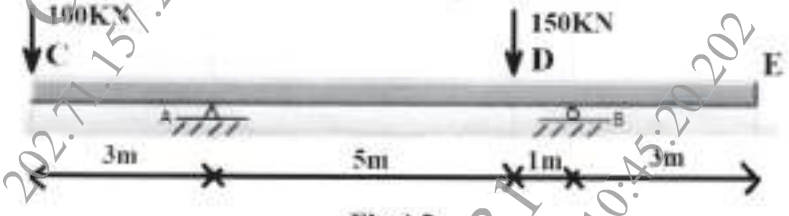

Fig 4.2

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PA-438

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S.E. (Automobile & Mechanical Engg./Mechanical S/W/ Automation & Robotics)

SOLID MODELING & DRAFTING

(2019 Pattern) (Semester - I) (202042)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Attempt Question 1 or 2 and Question 3 or 4.***
2) ***Figures to the right indicate full marks.***
3) ***Draw the neat sketch wherever necessary.***

Q1) a) What is computer-aided design? Explain the phases involved in it. **[6]**

b) Explain the difference between Wireframe. Surface & Solid Modeling with suitable examples and sketches. **[9]**

OR

Q2) a) Explain the feature-based geometric modeling approach with suitable examples. **[8]**

b) Explain the concept of VRML web-based viewing with a suitable example. **[7]**

Q3) a) Explain C^0, C^1, and C^2 continuities with a neat sketch. **[6]**

b) Write the parametric equation of line with endpoints A(1, 1, 1) and B(6, 8, 10). Find the coordinate of points at u = 0.25, 0.50, 0.75. **[9]**

OR

Q4) a) Distinguish between analytical and synthetic curves? **[6]**

b) Write Parametric Equation of Circle with center C(4, 4) and Radius 5 units. Find coordinates of points on circle at 30º, 45º and 60º. **[9]**

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S.E. (Mechanical /Automobile)

APPLIED THERMODYNAMICS

(2019 Pattern) (Semester - IV) (202048)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumption whenever necessary.***
5) ***Scientific calculator is allowed.***

Q1) a) Draw neat sketch and explain any three types of fuel injector nozzles used in CI engine. **[8]**

b) Draw neat sketches of any three types combustion chambers used in SI engines. **[9]**

OR

Q2) a) What is ignition delay in CI engines? Explain any three factors affecting the ignition delay. **[8]**

b) Explain with sketch the phenomenon of detonation in SI engine. State any two factors affecting flame speed. **[9]**

Q3) a) Explain Heat balance sheet with its different component. **[9]**

b) A single cylinder 4 – stroke engine gave the following results while running on full load : Area of indicator card = 300 mm^2; Length of diagram = 45 mm, Spring constant = 1.5 bar/mm; Speed of the engine = 400 rpm; Load on the brake = 370 N; Spring balance reading = 55 N; Diameter of brake drum = 1.2 m; Fuel consumption = 2.8 kg/h; Calorific value of fuel = 41800 kJ/kg; Diameter of cylinder = 160 mm; Stroke of piston = 200 mm. Calculate: **[9]**

i) Brake power.

ii) Indicated mean effective pressure.

iii) Brake specific fuel consumption.

iv) Brake thermal efficiency.

OR

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Q4) a) What is mean by Dynamometer? Explain working of any one type of Dynamometer with the help of neat sketch. **[9]**

b) During a test on a single cylinder, four stroke engine having a compression ratio of 8, following data were recorded: Bore = 12 cm; Stroke = 14.5 cm; Indicated mean effective pressure = 2.5 bar; Dead load on dynamometer, W = 60 N; Spring balance readings, S = 19 N; Effective radius of the flywheel, R = 40 cm; Fuel consumption, mf = 1.0 kg/hr., Calorific value of the fuel used, C = 42000 kJ/kg; Speed, N = 2500 rpm. Determine its indicated power, brake power, mechanical efficiency, air standard efficiency. **[9]**

Q5) a) Enumerate the various components of IC engine to be lubricated. Explain with neat sketch any one type of lubrication system. **[8]**

b) Explain the need of lubrication of Engine in Automobiles. List down the different Engine components lubricated in the Automobiles. **[9]**

OR

Q6) a) Draw neat, labelled sketch of battery ignition system. List down various parts of battery ignition systems. **[8]**

b) Enumerate the various alternative fuels for IC engines. What are the advantages and disadvantages of LPG as alternative fuel in engine? **[9]**

Q7) a) What are the advantages of multi-staging in reciprocating air compressor? **[6]**

b) Compare rotary compressor with reciprocating compressor. A single stage reciprocating compressor takes 1 m^3 of air per minute at 1.013 bar at 15°C and delivers it at 7 bar according to law $PV^{1.35}$ = constant, and clearance is negligible. **[6]**

c) Calculate: **[6]**

i) Mass of the air delivered per minute

ii) Delivery temperature

iii) Indicated power

Take individual gas constant R = 287 J/kgK

OR

Q8) a) Explain with neat sketch multi-stage reciprocating air compressor. **[6]**

b) Explain roots blower compressor with neat sketch. **[6]**

c) A single stage single acting reciprocating air compressor has entering at 1 bar, 20°C and compression occurs following polytropic with index 1.2 up to the delivery pressure of 12 bar. The compressor runs at the speed 240 rpm and has L/D ratio of 1.8 the compressor has mechanical efficiency of 0.88. Determine the isothermal efficiency and cylinder dimesions. Also find out the rating of drive required to run the compressor which admits 1m^3 of air per minute. **[6]**

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