



**Punjab Engineering College, Chandigarh**  
**End-Term Examination, 11<sup>th</sup> August 2021**

**Programme: B.E (Civil & Mechanical Engineering)**

**Course Name: Introduction to Mechatronics**

**Maximum Marks: 100**

**Year/Semester: 2020-21(2<sup>nd</sup> Sem.)**

**Course Code: ES-3101**

**Time allowed: 2.00 Hours**

**Notes:**

- All questions are compulsory.
- Unless stated otherwise, the symbols have their usual meanings in context with subject. Assume suitably and state, additional data required, if any.
- The candidates, before starting to write the solutions, should check the question paper for any discrepancy, and also ensure that they have been delivered the question paper of right **course code**.

		<b>Marks</b>
1. (a)	Draw a schematic diagram of microprocessor based intelligent system with sensing system, signal conditioning controller related actuator system to control water level (L), temperature (T), and pressure (P) due to vapour produced in the system.	4+4+5
(b)	Draw self-explanatory diagrams for any four sensors /transducers for measurement of temperature.	3x4=12
2. (a)	Draw the circuits and write final input output relation for difference, logarithmic, anti-logarithmic OPAMPs, along with input and output signals characteristics.	4x3=12
(b)	In order to illustrate working principle of an ADC system, draw the flow chart program for conversion of sensor output Analog signal to Digital signal using Analog to Digital Converter (ADC).	13
3. (a)	Write down the pin diagram of 8085 microprocessors.	12
(b)	A 3 phase squirrel cage induction motor is used as actuator to mix liquid solution by rotating clockwise and anticlockwise rotor movement; explain its working principle, construction and operation. Also, write how clockwise and anticlockwise motion is achieved?	12+1
4. (a)	What are functions of automation system? Write main components and their roles.	3+4
(b)	Design with a self-explanatory diagram, equipped with sensors system, mechanism and controller algorithm for logical implementation of the decision for an intelligent class room system with 03 features (statement).	18





Punjab Engineering College (Deemed to be University)  
End-Term Examination (13.8.2021)

Programme: B.E (Mech & Civil)  
Course Name: Strength of Materials  
Maximum Marks: 80

Year/Semester: 2<sup>nd</sup> Sem  
Course Code: ES1601  
Time allowed: 2 Hours

Notes:

- All questions are compulsory.
- The candidates before starting to write the solution, should please check the question paper for any discrepancy and ensure that they have delivered the question paper of right course code

- Ques 1 (a) Draw stress strain diagram for ductile materials and indicate all salient features on it. **5M**
- (b) A signal is being worked by steel wire 600 m long and 6.25 mm is diameter. Find the movement which must be given to the signal box end of wire, at a pull of 1.5 kN, if the movement of the signal end is to be 180mm. Take  $E = 2.05 \times 10^5 \text{ N/mm}^2$ . **5M**
- Ques 2 (a) Write the relationship between Shear Modulus and Young Modulus of Elasticity. **4M**
- (b) A compound bar consists of copper rod 20 mm in diameter and steel tube 60mm in external diameter and 50 mm in internal diameter. The copper rod and steel tube are assembled coaxially and their ends are rigidly fixed at  $30^\circ \text{C}$ . If the compound bar is heated to  $130^\circ \text{C}$ . Determine the stress induced in each metal. Take  $E_s = 200 \text{ kN/mm}^2$ ,  $E_{cu} = 120 \text{ kN/mm}^2$ ,  $\alpha$  for steel =  $12 \times 10^{-6}/^\circ\text{C}$  and  $\alpha$  for copper =  $18 \times 10^{-6}/^\circ\text{C}$ . **10M**
- Ques 3 (a) State the analytical method to determine stresses on oblique section of a member subjected to axial loading. **4 M**
- (b) A point in a strained material is subjected to principal stresses  $600 \text{ N/mm}^2$  and  $300 \text{ N/mm}^2$ , both the stresses being tensile in nature. For an oblique plane making an angle of  $30^\circ$  with the plane of major principal stress, determine the following by Mohr's stress circle.
- i) Normal stress, ii) Shear stress, iii) Resultant Stress. **10 M**
- Ques 4 (a) i) What do you mean by points of contraflexure ? **(2X2) M**
- ii) Write down sign convention for drawing S.F. and B.M. diagrams.
- (b) Draw a shear force and bending moment diagram for the beam shown in fig.1 and locate the point of contra flexure, if any. **10 M**



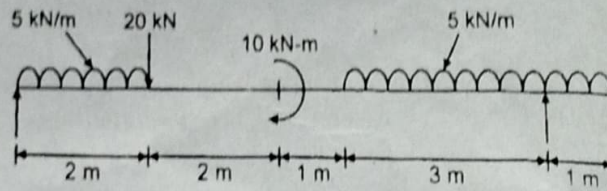


Fig. 1

Ques 5 The shear force acting on a beam at I section with unequal flanges is 50 kN. The section is shown in Fig.2. The moment of inertia of the section about N.A. is  $2.849 \times 10^4$ . Calculate the shear stress at the N.A. and also draw the shear stress distribution over the depth of section.

14 M

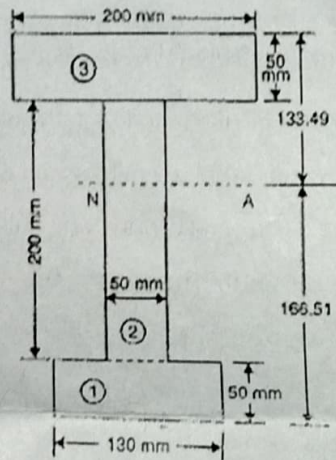


Fig. 2

Ques 6 (a) Why brittle and ductile materials fail in different ways due to pure torsion?

4M

(b) A hollow shaft is 800 mm long and has external diameter 40 mm. It has 16 mm internal diameter for a part of the length and 24 mm internal diameter for the rest of the length. If the maximum shear stress in it is not to exceed 70 MPa, determine the maximum power transmitted by it at a speed of 200 rpm. If the twist produced in two portions of the shafts are equal, find the length of the two portions.

10M





**Punjab Engineering College (Deemed to be University), CHANDIGARH**  
**End Term Examination (20212)**

Programme: B.E. (Civil)  
Course Name: Probability and Statistics  
Maximum Marks: 50

Year/Semester: 20212  
Course Code: MA1301  
Time allowed: 2hrs

**NOTES:**

- All questions are compulsory
- The candidates before starting to write the solutions, should please check the question paper for any discrepancy and also ensure that they have been delivered the question paper of right course code.

Q.No.	Questions	Marks
Q1	Over a period of a few months an engineer found that her computer would often hang up while she was doing internet searches. She postulates that the probability is 0.1 that any half hour search session will require at least one reboot of the computer. Next week she will perform 3 half hour searches, each on a different day. (i) List all possible outcomes for the 3 searches in terms of success 'S' (no hang up), and failure 'F' (at least one hang up), during each session. (ii) Find the probability distribution of the number of successes $X$ , among the three searches.	4
Q2	Let $X_1, X_2, \dots, X_{20}$ be independent random variables and let each have the same distribution with mean 20 and variance 4. Find (i) $E(X_1 + X_2 + \dots + X_{20})$ (ii) $Var(X_1 + X_2 + \dots + X_{20})$ (iii) $E(X_1 - X_2)$ (iv) $Var(X_1 - X_2)$ .	4
Q3	Suppose $X$ is a normal random variable with mean $\mu$ and standard deviation $\sigma$ . Demonstrate that Chebyshev's theorem holds for $k = 2$ and $k = 3$ .	4
Q4	The average number of field mice per acre in a 5-acre wheat field is estimated to be 12. Find the probability that fewer than 7 field mice are found (a) on a given acre. (b) on 2 of the next 3 acres inspected.	4
Q5	The probability that a patient recovers from a delicate heart operation is 0.9. Of the next 100 patients having this operation, what is the probability that (a) between 84 and 95, both inclusive, survive? (b) fewer than 86 survive?	4
Q6	Find the moment generating function of $X$ , if $X$ is a random variable having Poisson distribution. Also find mean of Poisson distribution using this function.	4
Q7	A machine is producing metal pieces that are cylindrical in shape. A sample of pieces is taken and the diameters are 1.01, 0.97, 1.03, 1.04, 0.99, 0.98, 0.99, 1.01 and 1.03 cms. Find a 99% confidence interval for the mean diameter of pieces from this machine, assuming an approximate normal distribution.	5
Q8	The IQ's of 16 students from one area of a city showed a mean of 107 and a standard deviation of 10, while the IQ's of 14 students from another area of the city showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQ's of two groups at 1% and 5% level of significance?	5

*Sumit*  
9/8/21

*Rohit*  
9/8/21



Q 9	A new rocket-launching system is being considered for deployment of small, short-range rockets. The existing system has $p = 0.8$ as the probability of a successful launch. A sample of 40 experimental launches is made with the new system and 34 are successful. Construct a 95% confidence interval for $p$ . Would you conclude that the new system is better?	5
Q 10	A dry cleaning establishment claims that a new spot remover will remove more than 70% of the spots to which it is applied. To check this claim, the spot remover will be used on 12 spots chosen at random. If fewer than 11 of the spots are removed, we shall not reject the null hypothesis that $p = 0.7$ , otherwise we conclude that $p > 0.7$ . (i) Evaluate $\alpha$ assuming that $p = 0.7$ (ii) Evaluate $\beta$ for the alternative $p = 0.9$	6
Q 11	An electrical firm manufactures light bulbs that have a lifetime that is approximately distributed with a mean of 800 hours and a standard deviation of 40 hours. Test the hypothesis that $\mu = 800$ hours against the alternative $\mu \neq 800$ hours, if a random sample of 30 bulbs has an average life of 788 hours. Use 0.1 as level of significance.	5

### Statistical Values:

$$\sum_{x=0}^6 p(x; 12) = 0.0458, \sum_{x=0}^7 p(x; 12) = 0.0895, \sum_{x=0}^8 p(x; 10) = 0.3328, \sum_{x=0}^5 p(x; 10) = 0.0671$$

$$\sum_{x=0}^3 b(x; 8, 0.6) = 0.1737, \sum_{x=0}^2 b(x; 8, 0.6) = 0.0498, \sum_{x=0}^4 b(x; 8, 0.6) = 0.4059.$$

$$\sum_{x=0}^2 b(x; 7, 0.4) = 0.4199, \sum_{x=0}^2 b(x; 7, 0.3) = 0.6471, \sum_{x=0}^{10} b(x; 12, 0.7) = 0.9150$$

$$\sum_{x=0}^{11} b(x; 12, 0.7) = 0.9862, \sum_{x=0}^{12} b(x; 12, 0.9) = 1, \sum_{x=0}^{10} b(x; 12, 0.9) = 0.3410$$

$$z_{0.9821} = -2.1, z_{0.9265} = -1.45, z_{0.8264} = 0.94, z_{0.05} = 1.645, z_{0.0351} = 1.81, z_{0.025} = 1.96,$$

$$z_{0.0192} = 2.07, z_{0.0179} = 2.1, z_{0.01} = 2.33, z_{0.005} = 2.58,$$

$$t_{0.025, 4} = 2.776, t_{0.05, 4} = 2.132, t_{0.05, 5} = 2.015, t_{0.025, 5} = 2.571, t_{0.01, 8} = 2.896,$$

$$t_{0.005, 8} = 3.355, t_{0.005, 10} = 2.28, t_{0.01, 28} = 2.4, t_{0.005, 28} = 2.76, t_{0.025, 28} = 2.05, t_{0.05, 28} = 1.7$$

$$t_{0.005} = 3.25 (\nu = 9), t_{0.01} = 2.821 (\nu = 9), t_{0.05} = 1.729 (\nu = 19), t_{0.025} = 2.093 (\nu = 19)$$

The following table gives the values of  $F(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} dz$

$z$	-1.91	-2.08	-1.39	-.657	.0571	.77	1.485	1.83	1.04	.6	-1.8	1.4
$F(z)$	.0281	.0185	.0853	.2562	.5219	.7794	.9312	.9664	.8508	.7257	.0359	.9192
$z$	1.5	-2.17	-2.41	-1.15	2.02	0.75	1.65	-1.64	0.11	0.04	-2.14	1
$F(z)$	.9332	.0150	.0080	.1251	.9783	.7734	.9505	.0505	.5438	.5160	.0162	.8413

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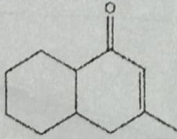
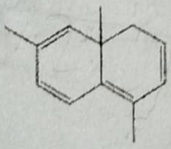




**PUNJAB ENGINEERING COLLEGE, CHANDIGARH**  
(DEEMED TO BE UNIVERSITY)  
End-Term Examination

Programme: **B.E. (Civil, Mech.)**  
Course Name: **Applied Chemistry II**  
Maximum Marks: **50**  
**Notes:** All questions are compulsory.

Year/Semester: **20-21/2nd**  
Course Code: **CH1201**  
Time allowed: **2.0 Hours**

Q.No.		Marks
1	(a) In making gold jewelry, the gold smith always adds copper metal to it. What is the role of added copper? Explain using the concept of Linear defects in solids?	[2]
	(b) How do you distinguish between crystalline sample and amorphous sample using XRD? What is the effect of crystallite size on the FWHM?	[3]
	(c) Does the spin system (high spin v. low spin) of a molecule play a role in Jahn-Teller effects? What spectroscopic methods would one utilize in order to observe Jahn-Teller distortions in a paramagnetic molecule?	[3]
	(d) Explain the process of anodizing with the help of a diagram?	[2]
2.	(a) Distinguish between the following based on IR and NMR spectra: (i) Acetone and ethanol      ii) Acetic acid and Ethyl acetate	[2]
	(b) What are the factors which affect Shift in UV Spectroscopy and calculate $\lambda_{\max}$ of following <div style="display: flex; justify-content: space-around; align-items: center;"><div style="text-align: center;"> (i)</div><div style="text-align: center;"> (ii)</div></div>	[2]
	(c) Give the principle of NMR spectroscopy	[2]
	(d) What do you understand by Kinetic and Thermodynamic control in reaction mechanism?	[2]
	(e) Explain the reaction co-ordinate diagram for an exothermic and endothermic reaction?	[2]
3	(a) What is reforming? Explain the process of reforming with the help of well labeled diagram.	[3]
	(b) A sample of fuel contains the following by weight: carbon= 81%; hydrogen=	[3]



		4%; oxygen= 2%; nitrogen= 10%; Sulphur= 1%, remainder ash. Calculate the volume of air required for the perfect combustion of 1 kg of fuel, assuming STP conditions.	
	(c)	What is catalytic converter? Explain different types of catalytic converters. Discuss the functioning of these by taking an account of redox reactions undergoing during their operation.	[2]
	(d)	Discuss the mechanism of Electrochemical corrosion in acidic environment.	[2]
4	(a)	Write the Nernst equation and emf of the following cells at 298K: $\text{Mg(s)} \text{Mg}^{2+}(0.001\text{M})  \text{Cu}^{+2}(0.0001\text{M}) \text{Cu(s)}$ $E^\circ_{\text{cell}} = 2.07\text{V}$	[3]
	(b)	How do biodegradable polymers degrade? What are Factors that influence the overall rate of degradation?	[3]
	(c)	How do you achieve stereospecific polymerization using Ziegler-Natta catalyst?	[2]
	(d)	Why are synthetic polymers more popular than natural polymers?	[2]
5	(a)	Discuss the temporary warming effect and cooling effect in a phase change materials.	[2]
	(b)	Explain self-cleaning materials with examples. Also discuss the role of contact angle for those materials?	[3]
	(c)	Describe Martensite and Austenite phases in shape memory alloys?	[3]
	(d)	What is piezoelectric material? Give two examples of such materials.	[2]



**Punjab Engineering College, Chandigarh**  
End-Term Examination

Programme: **B.Tech.**

Course Name: Engineering Drawing (Mech./Civil)

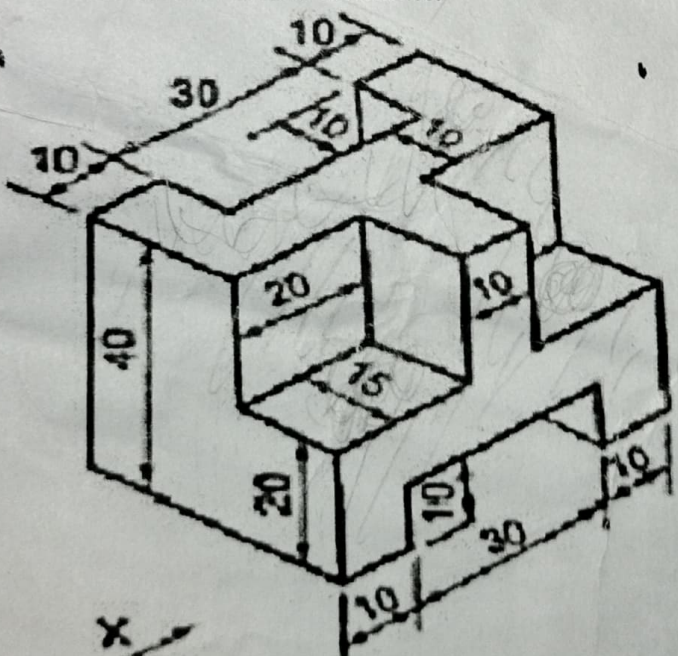
Maximum Marks: 85

Year/Semester: 2020-21-2

Course Code: **ESC-1201**

Time allowed: 2 Hours

**Notes:** All questions are compulsory. Assume any missing data suitably.

		Marks
1	A line PQ 100 mm long is inclined at $40^\circ$ to H.P. The end P is 15 mm above H.P. and the end Q is 60 mm in front of V.P. Draw the projections of the line if its F.V. measures 75 mm. Locate traces.	10
2	A <del>rectangular</del> pentagonal lamina of 25 mm side, rest on HP on one of its sides such that it is inclined to the HP at $30^\circ$ and the side on which it rests, inclined at $45^\circ$ to the VP. Draw its projection in first angle..	15
3	A right circular cone, diameter of base 50 mm and height 62 mm, lies on HP on one of its elements, with its axis parallel to VP. Draw the projection of the cone.	20
4	A hexagonal prism, side of base 25 mm long and axis 65mm long is resting on an edge of base on the H.P., its axis being inclined at $60^\circ$ to the H.P. and parallel to V.P. A section plane inclined at $30^\circ$ to the H.P. and perpendicular to the V.P. cuts the prism and passes through point on the axis at a distance of 15mm from the top end of the axis. Draw its sectional front view and true shape of the section.	20
5	<p>Draw the front view, top view and side view of object given below. All dimensions are in mm.</p> <p style="text-align: center;">Or</p> <p>A square pyramid resting centrally over a cylindrical block which is resting centrally on top of the Square block. Draw an <b>isometric projection</b> of the arrangement using isometric scale. consider the pyramid has a base of 25mm side and a 40 mm long axis, the cylinder block has a 50 mm base diameter and 20mm thickness and the square block has a 70mm base side and 15mm thickness.</p> 	20





**Punjab Engineering College (Deemed to be university)**  
**End-Term Examination**

Programme: B.E (Civil & Mech.)

Year/Semester: 2021/2<sup>nd</sup> sem

Course Name: Intro. to Electronics & Electrical Engg.

Course Code: ES1401

Maximum Marks: 50

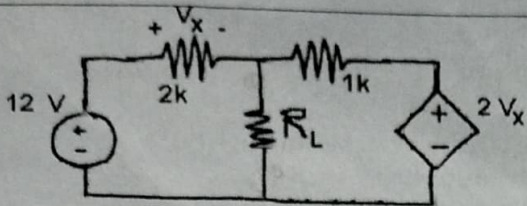
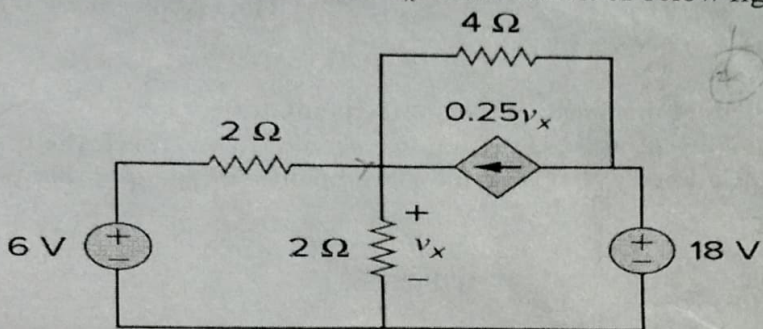
Time Allowed: 2 Hours

Notes:

- All Questions are compulsory.
- Unnecessary writing will deduct the marks. Write to the point answer
- The candidates, before starting to write the solutions, should please check the question paper for any discrepancy and also ensure that they have been delivered the question paper of right course code.

Sr. No.		Question	Marks
1.	(a)	List the characteristics of an Ideal OPAMP. Derive the appropriate relation of an OPAMP when it is used in as inverting and summing amp.	4
	(b)	Design an Electronic switch using BJT and explain its working.	3
	(c)	A p-channel JFET has device parameters of $I_{DSS} = 7.5 \text{ mA}$ and $V_P = 4 \text{ V}$ . Sketch the transfer characteristics.	2
	(d)	A silicon diode indicates forward current of $2 \text{ mA}$ and $10 \text{ mA}$ , when forward voltage across the diode is $0.6 \text{ V}$ and $0.7 \text{ V}$ respectively. Find the operating temperature of diode junction.	3
2.	(a)	Draw electronic digital circuit showing a lamp operated by two switches S1 and S2 that can be lit only if switch S1 is closed and S2 is open. Write its truth table also.	2
	(b)	Differentiate between sequential and combinational circuits.	2
	(c)	Implement full subtractor using two half subtractors. Also Write truth table of full subtractor.	2
	(d)	State Nyquist rule for sampling. What is quantization error.	2
	(e)	In a voting machine, counter has ability to count 256 votes at a time. How many flip-flops are required to construct such counter?	1
3.	(a)	What is the need of Modulation?	2
	(b)	The equation of amplitude modulated wave is given by $s(t) = 10[1 + 0.5\cos(4\pi \times 10^3 t)]\cos(4\pi \times 10^5 t)$ . Find the modulation index and the band width of AM wave.	2
	(c)	An FM wave is given by $s(t) = 5\cos(4\pi \times 10^6 t + 4\sin(8\pi \times 10^3 t))$ . Calculate the frequency deviation and write expression of modulating signal.	2
4.	(a)	State the kirchhoff's Law.	1
	(b)	State maximum power transfer theorem. Find the value of load resistor $R_L$ in the below network that will achieve the maximum power transfer and determine the values of the maximum power.	4



		
(c)	Use source transformation to find $v_x$ in the circuit of below figure. 	2
(d)	what is the difference between AC and DC Machines?	2
(e)	Derive relation between Electrical Frequency and Mechanical speed for AC machine.	2
(f)	Explain Working of transformer in detail with suitable diagram.	3
5. (a)	What are Accuracy and Precision in measurement of any electronics/electrical system? What is Bolometer?	3
(b)	How does a Wheatstone bridge work?	3
(c)	There are analog instruments available in a start-up company to measure the temperature of an oven. Draw the block diagram for analog measurement system to control the temperature of a heating oven using available analog instruments.	3