Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

Re-Exam End SEM- JAN-2020

PC-BTM302 – Strength of Material

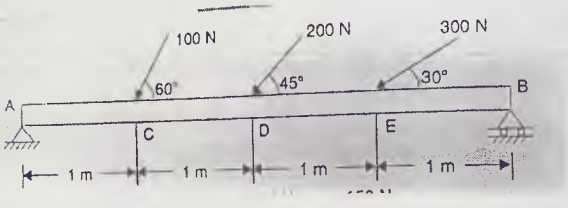
Class/sem: Second year B.Tech. (Mechanical-Engg)/ III

Duration: 3 hours **Marks: 100** **Date: 7th Jan-2020**

Note:

- Assume suitable Data if necessary.
- Question no. 1 is compulsory.
- Solve any four out of remaining six.

Q. no		Poin	CO	BL	PI
1	Answer the following:		1	1	1.3.1
	a) List various types of loads or forces acting on the components with suitable example.	2	1, 2		
	b) What is stress? List the different types of stress.	2			
	c) What is beam? What do you mean by *"statically indeterminate beam"?*	2			
	d) Draw the shape of shear force diagram in case of UDL and UVL for a cantilever beam.	2			
	e) What do you mean by terms ' neutral axis and neutral surface'?	2			
	f) Draw the stress-strain diagram for ductile material and define important points on the curve.	10			
2	a) Show that for a beam subjected to pure bending, neutral axis coincide with the centroid of the cross section.	10	1, 2	1, 2	1.1.1
	b) Prove the relation $\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$ for simple bending	10			
3	a) Derive the expression for slope and deflection for a cantilever beam with uniformly distributed load (UDL); also obtain the maximum slope and deflection value.	10	1, 2	2	2.2.3
	b) A beam 3 m long, simply supported at its ends, carries a point load W at its centre. If the slope at the ends of the beam is not to exceed 0.5^0, find the deflection at the centre of the beam.	10			
4	a) Derive the expression for shear stress distribution in circular cross section, also obtain the expression for maximum shear stress in terms of average shear stress.	10	1, 2	2	2.2.3
	b) A simply supported beam of span 1.5 m having a cross section 175 mm wide and 225mm deep carries a point load W at the center. The permissible stress are 12 MPa in bending and 3 MPa in shearing. Calculate the safe load W. If beam cross section is rotated through 90^0, does it affects on value of safe load? If yes, % change.	10			

5	a) Direct stresses of 140 MPa tensile and 100 MPa compressive exists on two mutually perpendicular planes at a certain points in a body. They are also accompanied by shear stresses on the plane. The greatest principal stress at a point due to this is 150 MPa. Find: -- The shearing stresses on the two planes, maximum shearing stress at the point. Also angle of principal plane and maximum shearing plane. b) A rectangular bar is subjected to two direct stresses in two mutually perpendicular directions. Derive the expression for normal and shear stress on an oblique plane inclined at an angle θ with the plane of major direct stress.	10 10	1, 2	2	2.2.3
6	A horizontal beam AB of length 4 m is hinged at A and supported on rollers at B. The beam carries inclined loads as shown in figure. Draw the Shear force and Bending moment and thrust diagram. 	20	1, 2	2	2.2.3
7	a) A uniform circular bar of length L and diameter d is extended by an amount δ under a tensile load of F. Show that if bar is used as cantilever beam with load W at free end, the maximum deflection is given by : $y = \frac{16W\delta L^2}{3Fd^2}$ b) Derive the governing differential equation of the beam $\frac{d^2y}{dx^2} = \frac{M}{EI}$	10 10	1, 2	2	2.2.3

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Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058.
Re-Examination 2019

Max. Marks: 100 Duration: 03 Hours
Class: S.Y. B. Tech Mech Elect Semester: III
Name of the Course: OCIS Course Code : HSMBTE 301
HSMBTM 307

Instruction: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is for their use.

1) **Question No.1, 2, and 3 is compulsory.**
2) **Out of remaining 4 questions attempt any 2**
3) **Answer to each new question to be started on a fresh page.**
4) **Figures in brackets on the right-hand side indicate full marks.**
5) **Please write answers to the point. Vague answers will not get marks**

Question No		Points	CO	BL	PI
Q1. A.	In modern times, working women are facing problems like eve-teasing, sexual harassment, harassment at workplace, gender discrimination at the time of promotions, salary fixation, Low salaried jobs, etc. You as the Head of women development cell of a Private sector Company have been asked by the Director of the company to write a report on gender discrimination at work places of your organization. Write a Memo report With your recommendations to overcome the problems. (Invent Necessary Details)	20	1, 2, 5,	02,03	12.2.2
Q2. A	In Response to the advertisement Write a job application along with your detailed resume. (Invent Necessary Details) Company Name: JBC Constructions Private Limited, Mumbai, Maharashtra Experience: 0 - 1 years, Skills: Civil Engineer, Functional Area: Construction, Manufacturing/Engineering Salary Offered:-18000 to 25000 Per month Education:-Bachelor of Technology (B.Tech), (Bachelor of Engineering (B.E.) in Civil Preferred skills:- 3D Cad Modeling, AutoCAD, MSCIT, TEKLA, Google	20	05	01,02	12.3.1

	Sketch up, knowledge of Steel, Supervisor Experience & 6 month Experience as Civil Engineer in Construction / Infrastructure preferred Gender:- Male & Female preferred				
Q.3.	**Imagine that you are the secretary in attendance at the 7th meeting of the management committee of Bombay department stores to be held on November 25th 2019. Draft the notice and minutes of this meeting assuming the agenda to be as follows. Please write the agenda in the correct format.** **a. Confirmation of minutes of the previous meeting** **b. Appointment of sales women** **c. Proposal for delivery vans** **d. New app for taking online orders** **e. Complains regarding the quality of dairy products** **f. Ban on plastic bags in all stores** **g Online service and delivery to customers** **h. Any other matter with the permission of Chairman** **i. Date for the next meeting**	20	01	03,04	10.3.1
Q.4. A.	Read the two case studies and evaluate the etiquette, also suggest how etiquette can be improved in the situations. **Case 1** The annual sales meeting has concluded and you have your chief executive officer (CEO) with you. He has invited the entire team of salespersons for a cocktail dinner. A few members of your team are new employees, and they are in their own world at the party, ignoring the fact that the senior managers and the CEO are also in the party. Some of them get heavily drunk and cause trouble. A few end up in a fight with the hotel stewards and cause chaos. The CEO leaves the hotel. Next day they get a red chit. **Case 2.** Two consultants were making an important presentation as part of a business proposal, sharing the presentation content. While the first person had to speak about the business and pricing, the other person was supposed to speak from a technical perspective. When the first person wanted the second person to takeover, he said, 'Now, Suraj Bhai will take over from here.'	20	02	01,02	10.2.3
Q.5. A	E Mail messages differ from letters in their physical makeup. Explain in detail the basic elements of an email.	(10)	1, 2,5	4	12.4.
Q.5. B.	Define Netiquette. Discuss the reasons for email's phenomenal growth	(10)	3,4,	07	10.3.
Q. 6. A	Case Study: 06 Sumitra was amongst the brilliant students in her MBA class. She was	(20)	2, 1	03, 01	10.1.

liked by all for her behavior and Merit. With a smiling face she would accept any responsibility entrusted to her by her teachers. However, there was one task; she would always run away from: giving a presentation. Whenever the teachers assigned a group task that she, she would do all the analysis, but would never give a presentation for fear of speaking in front of an audience.

She somehow managed to avoid having to give a presentation during her two years as an MBA student. When she started working, things remained the same. She used to do all the behind- the –scenes work and hand over the responsibility of giving a presentation to someone else. Sumitra later realized that because of fear of addressing an audience she was not able to come to the limelight. The hard work was done by her, but some other person who presented took away the credit that was due to her.

The situation continued for quite a few years. All her plans to improve failed, and she started out on losing out on promotions. The bosses never came to know that she was extremely hard in the background to get things done. Sumitra was frustrated and decided to leave the company.

She started sending applications to companies. Finally, a company based in Noida wanted to interview her. Sumitra flew to Delhi and attended the interview. The chief executive officer (CEO) was extremely happy with what she had been doing and was looking for a person with a similar profile to fill a vacancy. The interview was almost over, but the CEO wanted to test her for last time. Sumitra was asked to give a presentation on a topic of her choice to all the senior managers of the company and was given a day to prepare. Sumitra chose the topic 'Functioning of the stock market: Recent trends' as the company was a big name among stock broking firm.

However her fear of giving presentations, which she had been fighting for years, again came to haunt her. She could not run away anymore. This was a very good company and the profile was good. She first prepared the outline for the presentation on the topics that needed to be covered and then made the presentation. The CEO had given her 30 minutes for the presentation. She had made a mistake. She did not take in to account or ask the CEO as who would be the audience and whether he wanted something specific. To be covered.

The first step she took was to get the slide deck in place. She prepared a very broad outline on her computer directly, for her presentation. She also did not spend sufficient time to plan her content. The outline looked something like this.

TOPIC: Functioning of the stock market: Recent Trends

SCOPE: discuss the recent trends in the market.

1. History of the stock Markets. (15 minutes)
   < History of the markets, Liberalization of the markets>
2. Functioning of the stock markets (10 minutes)

< How stock markets function today, the electronic exchanges, and transparency>

3. Recent trends in the stock markets (5 minutes)
   < recent trends in the stock market and the interaction with SEBI (Securities and Exchange boards of India), future of the stock markets, and conclusion>

Since the time left for her was very little she did not note down the details of what needed to be covered under each heads. Time was flying, and she had to do some surfing on the Internet to get the slide deck in place. She started searching the stock market sites and quickly collected the information and started putting them in one of the three categories. There was so much of information that she was not able to judge what was relevant and what was not relevant for the presentation. Megha had, until then, avoided presenting and she was not confident about how much to prepare. She gathered over 60 slides for her 30 minute presentation.

She also had to prepare the 'script' to deliver. Over the years, she had not practiced to deliver extempore talks and felt that memorizing a script would be the best way. She quickly drafted a script and practiced over and over again for the entire night.

The next morning, when the time for her presentation came, she realized that the PPT file got corrupted. She forgot to carry a backup with her and finally realized that she mailed this PPT to her friend for approval. She managed to retrieve the file and started her presentation. Due to her fear she faltered, she forgot what she had written down. Seeing the audience she became nervous and all big people Wizards in stock marketing, highly experienced people were in front of her. She started reciting her script like a parrot, missing important lines and showing appropriate slides corresponding to her talk. She started reading verbatim from her script avowing eye- contact with the audience.

The CEO, who was sitting in one corner along with some of the senior colleagues of his, noticed this. He began to lose confidence in Megha, because the job involved many client presentations. The CEO asked Sumitra three questions about her presenting skills.

- Why is the scope so vague? Does it speak of any particular period?
- Of the 30 minutes allotted, the actual presentation of trends came only after the first 25 minutes? Why?
- Why were so many slides prepared, when the presentation was supposed to be for 30 minutes?

Questions:

1. How do you suggest Sumitra should have approached the presentation?
2. What should Sumitra do to overcome her fear of Presentations? Provide ten effective tips for being a successful presenter.

Q.7 . A.	The efficiency of a GD can be improved drastically by using some very simple tools of group dynamics. Discuss some of the tools.	(10)	01, 03,0 2,5	06	12.3.2
Q.7 .B	Explain the evaluation criteria for GD? List five dos and don'ts for GD	(10)	1, 2, 3, 4, 5.	1,2,3, 4, 5,	12.3.2

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END SEMESTER EXAMINATION

Program: **B. Tech. in Mechanical Engineering**
Class: **Second Year B. Tech. (Mechanical)**
Course code: **MC-BT002**
Name of the Course: **Indian Traditional Knowledge**

Date: **January- 2020**
Duration: **3 Hr.**
Max.Points:**100**
Semester: **III**

Instructions: Solve **ANY FIVE** Questions.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	a) **Explain:** *"India is the Richest Prize in the World in all respects."* **Justify:** with suitable examples.	(10)	1	V	6.1.1	1
	b) **Justify:** *"Fundamnetal unity of India since ancient times has been its gretatest strength"* giving suitable examples.	(10)	1	V	6.1.1	1
Q.2	a) **Justify:** *"Vedas are the oldest and most valuable treasure of knowledge in the library of mankid".*	(10)	1	I,V	6.1.1	2
	b) **Explain:** *"Upvedas are the valuable Indian Traditional Scripts revealing invaluable Indian Traditional Knowledge."*	(10)	1	V	6.1.1	2
Q.3	a) **Explain** *"Indian Wisdom is the great gift of India to the world civilization."* **Justify:** with significant examples.	(10)	1,2	V	6.1.1	3
	b) **Explain:** Co-existence of Science and Spirituality in India since ancient times with suitable examples and **Justify:** its relevance with modern times.	(10)	1,4	II,V	6.1.1	3
Q.4	a) **Explain:** Any two significant medical practices followed in ancient India.	(10)	2	II	6.1.1	4
	b) **Define:** Yoga. **Justify:** *"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	(10)	2	I,VI	6.1.1	4
Q.5	a) **Discuss:** Any two significant art forms in ancient India and Any Two valuable contributions by ancient Indian artists for the development of these art forms.	(10)	3	VI	6.1.1	5
	b) **Justify:** *"Ancient Indian Civilization was well advanced in Civil Engineering, Architecture and Town Planning."* Giving examples.	(10)	2,3	V	6.1.1	5
Q.6	a) **Explain:** Rich heritage of Indian Traditional Languages since ancient times.	(10)	3	II	6.1.1	6
	b) **Discuss:** Work of Saint Dnyaneshwar and his contribution to Indian society as a Yogi, Saint, Linguist and Philosopher.	(10)	2,3	VI	6.1.1	6,7
Q.7	a) **Discuss:** Teachings of Bhagwan Gautam Buddh and its **Importance** in today's modern independent India.	(10)	3,4	V, VI	6.1.1	7
	b) **Justify:** *" Teachings of Ancient Indian Saints are the Pearls of Widom for the entire mankind."*	(10)	3	V	6.1.1	7

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RE-EXAMINATION, January-2020

Program: **B. Tech. in Mechanical Engineering** Date: **09/01/2020**
Class: **Second Year B. Tech. (Mechanical)** Duration: **3 Hr.**
Course code: **PCC-BTM305** Max.Points:**100**
Name of the Course: **Thermodynamics** Semester: **III**

Instructions:

- Attempt **ANY 05** questions. Answers to theory questions should be brief and specific.
- Assume suitable data wherever necessary and state the same.
- Draw **neat** and labelled system diagram **and/or** process diagram **wherver necessary.**
- **Legible hand writing**, proper figures and tidy work carry weightage.
- Use of **Steam Tables and Mollier Diagram** is permitted.

Q. No.	Question	Points	CO	BL	PI	Module
1	**a) Explain:** i) Thermodynamic Equilibrium ii) Quasi-static Process. **Draw:** neat sketches.	**(10)**	1	I, II	1.4.1	1
	b) A closed system contains *2 kg* of air at *3 bar, 150°C*. It is stirred and expands till its pressure reduces to *1 bar*. During the process, the temperature of the system is maintained constant and the stirrer does the work of *120 kJ*. **Evaluate**:-i) Expansion Work done ii) Heat Transfer. Take $R = 287\ J/kg.K$ for air.	**(10)**	1	V	1.4.1	1
2	**a) Explain:** i) PMM-1 and its converse ii) Joule's Experiment. **Draw:** neat sketches	**(10)**	2	I,II	1.4.1	2
	b) State: General form of Steady Flow Energy Equation for a control volume. In a gas turbine, gas enters at the rate of *5 kg/s* with a velocity of *50 m/s* and enthalpy of *900 kJ/kg*, and leaves the turbine with a velocity of *150 m/s* and enthalpy of *400 kJ/kg*. Heat loss from the gases in turbine to the surrounding is *25 kJ/kg*. The inlet conditions of the gas are *100 kPa* and *300 K*. Take $R=0.285\ kJ/kg.K$; $c_p = 1.004\ kJ/kg.K$ for the gas. **Evaluate:** i) Power output of turbine ii) Temperature at exit of turbine.	**(10)**	2	V	1.4.1	2
3	**a) Explain**: Kelvin-Planck and Clausius statements of Second Law of thermodynamics and **Justify:** Equivalence of both the staememnts with neat diagrams.	**(10)**	2	II,V	1.4.1	3
	b) Prove : $COP_{HP} = 1 + COP_R$; An inventor claims that he has invented a refrigerator operating between *-23°C* and *27°C*. It consumes *1 kW* of power and gives Refrigerating effect of *20000 kJ* in 1 hr. **Determine:** Whether the claim by the inventor valid or not.	**(10)**	2	II, V	1.4.1	3

4.	**a) Explain:** i) Principle of increase of Entropy ii) Claussius' Inequality **b)** 0.05 m^3 of Nitrogen gas at an initial state of 1 bar and 27° C is compressed in a piston cylinder arrangement to a final pressure of 4 bar in reversible isothermal process. For Nitrogen R= 0.297 kJ/kg.K; $\gamma = 1.4$. **Evaluate:** i) Heat Transfer ii) Change in entropy of the system iii) Change in entropy of universe. **Draw:** System diagram and p-V diagram.	**(10)**	3	I, V	1.4.1	4
5	**a) Prove:-** $v = v_f + x.v_{fg}$; Steam initially at 1.5 *MPa and* 300°C expands reversibly and adiabatically in a steam turbine to 40°C. **Evaluate:** i) Ideal Turbine shaft work per kg of steam. ii) Quality of steam at turbine exit.**Draw:** Neat System and process diagrams. **b)** A Steam power plant operates on a Rankine cycle between a boiler pressure of *4 MPa* at *300°C* and condenser pressure of *50 kPa*. Considering η_p *and* η_T = 80%, cycle, **Evaluate:** i) Net work output, ii) Thermal efficiency of cycle. **Draw:** Neat System and process diagrams.	**(10)** **(10)**	3 3	I, V I, V	1.4.1 1.4.1	5 5
6	**a) Explain:** Working of air standard Brayton cycle for gas turbine plant with Intercooling. **Discuss:** Effect of intercooling on thermal efficiency of air standard Brayton cycle. **Draw:** System diagrams, p-V and T-s diagram to illustrate the answer. **b)** An ideal Diesel engine operates within the temperature limits of 1700*K and* 300*K* with a compression ratio of 16. **Draw:** p-V and T-s diagrams for the cycle and **Evaluate:** i) Pressures and temperatures at cardinal points ii) Thermal efficiency iii) Mean Effective Pressure	**(10)** **(10)**	3 3	I, V V	1.4.1 1.4.1	6 6
Q.7	**Explain: Any THREE** of the following: **a)** Enthalpy of Formation and Enthalpy of Combustion **b)** Adiabatic Flame Temperature **c)**Zeroth Law of Thermodynamics and International Practical Temperature Scale (IPTS) **d)** Reheat Cycle **e)** Regeneration in Gas Turbines	**(20)**	 4 4 2 3 1	II	1.4.1	 7 7 2 5 6

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PC-BTM302 – Strength of Material

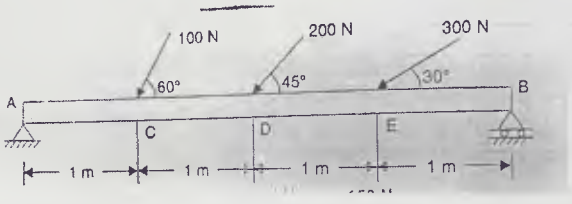
Class/sem: Second year B.Tech. (Mechanical-Engg)/ III

Duration: 3 hours **Marks: 100** **Date: 7th Jan-2020**

Note:

- Assume suitable Data if necessary.
- Question no. 1 is compulsory.
- Solve any four out of remaining six.

Q. no		Poin	CO	BL	PI
1	Answer the following:		1	1	1.3.
	a) List various types of loads or forces acting on the components with suitable example.	2	1, 2		1
	b) What is stress? List the different types of stress.	2			
	c) What is beam? What do you mean by *"statically indeterminate beam"?*	2			
	d) Draw the shape of shear force diagram in case of UDL and UVL for a cantilever beam.	2			
	e) What do you mean by terms ' neutral axis and neutral surface'?	2			
	f) Draw the stress-strain diagram for ductile material and define important points on the curve.	10			
2	a) Show that for a beam subjected to pure bending, neutral axis coincide with the centroid of the cross section.	10	1, 2	1, 2	1.1. 1
	b) Prove the relation $\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$ for simple bending	10			
3	a) Derive the expression for slope and deflection for a cantilever beam with uniformly distributed load (UDL); also obtain the maximum slope and deflection value.	10	1, 2	2	2.2. 3
	b) A beam 3 m long, simply supported at its ends, carries a point load W at its centre. If the slope at the ends of the beam is not to exceed 0.5^0, find the deflection at the centre of the beam.	10			
4	a) Derive the expression for shear stress distribution in circular cross section, also obtain the expression for maximum shear stress in terms of average shear stress.	10	1, 2	2	2.2. 3
	b) A simply supported beam of span 1.5 m having a cross section 175 mm wide and 225mm deep carries a point load W at the center. The permissible stress are 12 MPa in bending and 3 MPa in shearing. Calculate the safe load W. If beam cross section is rotated through 90^0, does it affects on value of safe load? If yes, % change.	10			

5	a) Direct stresses of 140 MPa tensile and 100 MPa compressive exists on two mutually perpendicular planes at a certain points in a body. They are also accompanied by shear stresses on the plane. The greatest principal stress at a point due to this is 150 MPa. Find: -- The shearing stresses on the two planes, maximum shearing stress at the point. Also angle of principal plane and maximum shearing plane. b) A rectangular bar is subjected to two direct stresses in two mutually perpendicular directions. Derive the expression for normal and shear stress on an oblique plane inclined at an angle θ with the plane of major direct stress.	10 10	1, 2	2	2.2.3
6	A horizontal beam AB of length 4 m is hinged at A and supported on rollers at B. The beam carries inclined loads as shown in figure. Draw the Shear force and Bending moment and thrust diagram. 	20	1, 2	2	2.2.3
7	a) A uniform circular bar of length L and diameter d is extended by an amount δ under a tensile load of F. Show that if bar is used as cantilever beam with load W at free end, the maximum deflection is given by : $y = \frac{16W\delta L^2}{3Fd^2}$ b) Derive the governing differential equation of the beam $\frac{d^2y}{dx^2} = \frac{M}{EI}$	10 10	1, 2	2	2.2.3

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END SEMESTER EXAMINATION

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Class: **Second Year B. Tech. (Mechanical)**
Course code: **MC-BT002**
Name of the Course: **Indian Traditional Knowledge**

Date: **January- 2020**
Duration: **3 Hr.**
Max.Points:**100**
Semester: **III**

Instructions: Solve **ANY FIVE** Questions.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	**a) Explain:** *"India is the Richest Prize in the World in all respects."* **Justify:** with suitable examples.	**(10)**	1	V	6.1.1	1
	b) Justify: "*Fundamnetal unity of India since ancient times has been its gretatest strength"* giving suitable examples.	**(10)**	1	V	6.1.1	1
Q.2	**a) Justify:** *"Vedas are the oldest and most valuable treasure of knowledge in the library of mankid".*	**(10)**	1	I,V	6.1.1	2
	b) Explain: *"Upvedas are the valuable Indian Traditional Scripts revealing invaluable Indian Traditional Knowledge."*	**(10)**	1	V	6.1.1	2
Q.3	**a) Explain** *"Indian Wisdom is the great gift of India to the world civilization."* **Justify:** with significant examples.	**(10)**	1,2	V	6.1.1	3
	b) Explain: Co-existence of Science and Spirituality in India since ancient times with suitable examples and **Justify:** its relevance with modern times.	**(10)**	1,4	II,V	6.1.1	3
Q.4	**a) Explain:** Any two significant medical practices followed in ancient India.	**(10)**	2	II	6.1.1	4
	b) **Define:** Yoga. **Justify:** *"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	**(10)**	2	I,VI	6.1.1	4
Q.5	**a) Discuss:** Any two significant art forms in ancient India and Any Two valuable contributions by ancient Indian artists for the development of these art forms.	**(10)**	3	VI	6.1.1	5
	b) Justify: *"Ancient Indian Civilization was well advanced in Civil Engineering, Architecture and Town Planning."* Giving examples.	**(10)**	2,3	V	6.1.1	5
Q.6	**a) Explain:** Rich heritage of Indian Traditional Languages since ancient times.	**(10)**	3	II	6.1.1	6
	b) Discuss: Work of Saint Dnyaneshwar and his contribution to Indian society as a Yogi, Saint, Linguist and Philosopher.	**(10)**	2,3	VI	6.1.1	6,7
Q.7	**a) Discuss:** Teachings of Bhagwan Gautam Buddh and its **Importance** in today's modern independent India.	**(10)**	3,4	V, VI	6.1.1	7
	b) Justify: *" Teachings of Ancient Indian Saints are the Pearls of Widom for the entire mankind."*	**(10)**	3	V	6.1.1	7

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RE-EXAMINATION, January-2020

Program: **B. Tech. in Mechanical Engineering** Date: **09/01/2020**
Class: **Second Year B. Tech. (Mechanical)** Duration: **3 Hr.**
Course code: **PCC-BTM305** Max.Points:**100**
Name of the Course: **Thermodynamics** Semester: **III**

Instructions:

- Attempt **ANY 05** questions. Answers to theory questions should be brief and specific.
- Assume suitable data wherever necessary and state the same.
- Draw **neat** and labelled system diagram **and/or** process diagram **wherver necessary.**
- **Legible hand writing**, proper figures and tidy work carry weightage.
- Use of **Steam Tables and Mollier Diagram** is permitted.

Q. No.	Question	Points	CO	BL	PI	Module
1	**a) Explain:** i) Thermodynamic Equilibrium ii) Quasi-static Process. **Draw:** neat sketches.	**(10)**	1	I, II	1.4.1	1
	b) A closed system contains *2 kg* of air at *3 bar, 150°C*. It is stirred and expands till its pressure reduces to *1 bar*. During the process, the temperature of the system is maintained constant and the stirrer does the work of *120 kJ*. **Evaluate**:-i) Expansion Work done ii) Heat Transfer. Take $R = 287\ J/kg.K$ for air.	**(10)**	1	V	1.4.1	1
2	**a) Explain:** i) PMM-1 and its converse ii) Joule's Experiment. **Draw:** neat sketches	**(10)**	2	I,II	1.4.1	2
	b) State: General form of Steady Flow Energy Equation for a control volume. In a gas turbine, gas enters at the rate of *5 kg/s* with a velocity of *50 m/s* and enthalpy of *900 kJ/kg*, and leaves the turbine with a velocity of *150 m/s* and enthalpy of *400 kJ/kg*. Heat loss from the gases in turbine to the surrounding is *25 kJ/kg*. The inlet conditions of the gas are *100 kPa* and *300 K*. Take $R=0.285\ kJ/kg.K$; $c_p = 1.004\ kJ/kg.K$ for the gas. **Evaluate:** i) Power output of turbine ii) Temperature at exit of turbine.	**(10)**	2	V	1.4.1	2
3	**a) Explain**: Kelvin-Planck and Clausius statements of Second Law of thermodynamics and **Justify:** Equivalence of both the staememnts with neat diagrams.	**(10)**	2	II,V	1.4.1	3
	b) Prove : $COP_{HP} = 1 + COP_R$; An inventor claims that he has invented a refrigerator operating between *-23°C* and *27°C*. It consumes *1 kW* of power and gives Refrigerating effect of *20000 kJ* in 1 hr. **Determine:** Whether the claim by the inventor valid or not.	**(10)**	2	II, V	1.4.1	3

4.	**a) Explain:** i) Principle of increase of Entropy ii) Claussius' Inequality **b)** 0.05 m^3 of Nitrogen gas at an initial state of 1 bar and 27° C is compressed in a piston cylinder arrangement to a final pressure of 4 bar in reversible isothermal process. For Nitrogen R= 0.297 kJ/kg.K; $\gamma = 1.4$. **Evaluate:** i) Heat Transfer ii) Change in entropy of the system iii) Change in entropy of universe. **Draw:** System diagram and p-V diagram.	**(10)**	3	I, V	1.4.1	4
5	**a) Prove:-** $v = v_f + x.v_{fg}$; Steam initially at 1.5 *MPa and* 300°*C* expands reversibly and adiabatically in a steam turbine to 40°*C*. **Evaluate:** i) Ideal Turbine shaft work per kg of steam. ii) Quality of steam at turbine exit.**Draw:** Neat System and process diagrams.	**(10)**	3	I, V	1.4.1	5
	b) A Steam power plant operates on a Rankine cycle between a boiler pressure of *4 MPa* at *300°C* and condenser pressure of *50 kPa*. Considering η_p *and* η_T = 80%, cycle, **Evaluate:** i) Net work output, ii) Thermal efficiency of cycle. **Draw:** Neat System and process diagrams.	**(10)**	3	I, V	1.4.1	5
6	**a) Explain:** Working of air standard Brayton cycle for gas turbine plant with Intercooling. **Discuss:** Effect of intercooling on thermal efficiency of air standard Brayton cycle. **Draw:** System diagrams, p-V and T-s diagram to illustrate the answer.	**(10)**	3	I, V	1.4.1	6
	b) An ideal Diesel engine operates within the temperature limits of 1700*K and* 300*K* with a compression ratio of 16. **Draw:** p-V and T-s diagrams for the cycle and **Evaluate:** i) Pressures and temperatures at cardinal points ii) Thermal efficiency iii) Mean Effective Pressure	**(10)**	3	V	1.4.1	6
Q.7	**Explain: Any THREE** of the following:	**(20)**		II	1.4.1	
	a) Enthalpy of Formation and Enthalpy of Combustion		4			7
	b) Adiabatic Flame Temperature		4			7
	c)Zeroth Law of Thermodynamics and International Practical Temperature Scale (IPTS)		2			2
	d) Reheat Cycle		3			5
	e) Regeneration in Gas Turbines		1			6

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re Examinations (For Academic Year 2017-18)- January 2020

Program: Mechanical Engineering
Course Code: BTM301
Course Name: Applied Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
3. Answers to sub questions should be grouped together.

Q.No.	Questions	Points
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^{t}}\right)dt=\frac{3\pi}{4}$	6
(b)	Find the image of the rectangular region bounded by the lines $x=0$, $x=1$, $y=0$, $y=2$ in the z plane under the transformation $w=z+(2-i)$. Draw the sketch.	6
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{-3t}erf(4\sqrt{t})\}$	6
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6
(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8

3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix} 8 & 3 & 6 & 1 \\ -1 & 6 & 4 & 2 \\ 7 & 9 & 10 & 3 \end{bmatrix}$	6
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y=\sin 2t$ where $y(0)=1,\ y'(0)=2$	6
(c)	Find Fourier Series Expansion of following function in the interval $(0,2\pi)$ $f(x)=\begin{cases} x & 0\le x\le \pi \\ 2\pi-x, & \pi\le x\le 2\pi \end{cases}$	8
4(a)	Find the image of the circle $\lvert z-1\rvert=1$ under the transformation $\frac{1}{z}$	6
(b)	Find Half Range Fourier sine Series of $f(x)=lx-x^2,\quad 0<x<l$	6
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. Hence find A^{-1}	8
5(a)	Show that the set $S=\{\cos x,\ \cos 2x,\ \cos 3x,\cdots\}$ is Orthogonal over $(0,2\pi)$.	6
(b)	If $A=\begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$, using Cayley Hamilton Theorem, find A^{100}	6
(c)	Evaluate (i) $L^{-1}\left\{\frac{2s^2+5s+2}{(s-1)^3}\right\}$ (ii) $L^{-1}\left\{\log\left(1+\frac{4}{s^2}\right)\right\}$	8
6(a)	Find an analytic function $f(z)=u(x,y)+iv(x,y)$ if $v=e^{-x}\left[2xy\cos y+\left(y^2-x^2\right)\sin y\right]$	6

(b)	Find Eigen values of the matrix $A=\begin{bmatrix}\cos\theta & \sin\theta & 0\\ -\sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{bmatrix}$	6
(c)	Find the bilinear transformation which maps the points $2,\ i,\ -2$ of $z-$plane onto $1,\ i,\ -1$ of $w-$plane respectively	8
7(a)	Show that the transformation $w=\dfrac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle in the w-plane.	6
(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6
(c)	Evaluate $L^{-1}\left\{\dfrac{s}{s^4+4}\right\}$	8

(1)

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re Examinations (For Academic Year 2018-19)- January 2020

Program: Mechanical Engineering
Course Code: BSC-BTM301
Course Name: Applied Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory
2. Attempt any four questions out of remaining six
3. Answers to sub questions should be grouped together.

Q.No.	Questions	Points
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^{t}}\right)dt=\frac{3\pi}{4}$	6
(b)	Find the image of the rectangular region bounded by the lines $x=0$, $x=1$, $y=0$, $y=2$ in the z plane under the transformation $w=z+(2-i)$. Draw the sketch.	6
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{-t}erf(\sqrt{t})\}$	6
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(b)	Find Eigen values of the matrix $A = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$	6
(c)	Find the bilinear transformation which maps the points $2, i, -2$ of $z-$plane onto $1, i, -1$ of $w-$plane respectively	8
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(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6
(c)	Evaluate $L^{-1}\left\{\frac{s}{s^4+4}\right\}$	8

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Re-Examination - January 2020 Examinations

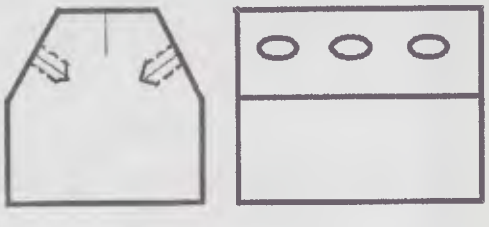
Program: Mechanical Engineering | Duration: 03 hour

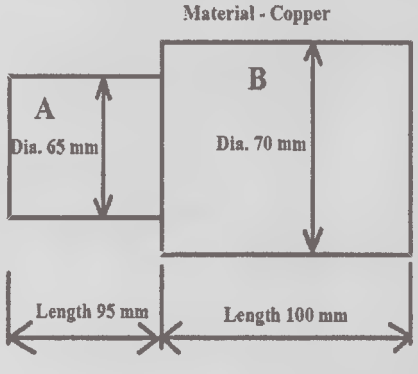
Course Code: PCC-BTM306 | Maximum Points: 100 marks

Course Name: **Manufacturing Science** | Semester: III

Notes: 1.Questions number **01** is compulsory.
2. Solve any FOUR questions out of remaining SIX main questions.
2. Draw neat schematic diagrams wherever is necessary, **highlight** important points.
3. Answer should be **point-wise** and assume suitable data if necessary and mention it.

Q. No.	Questions	Pts	CO	BL	PI
Q1 A	Explain super abrasive grinding wheel compositional *specification*? Explain each alpha numeric terms in details which describes grinding wheel?	10	2, 4	3, 2	2.1.2
Q1 B	Estimate *best welding speed* to be used for welding of 10 mm thick mild steel plates with an ambient temperature of 27° C with welding transformer set at 28 V and current passing is 275 A. Arc efficiency is 0.9 and possible travel speeds are 5 to 10 mm/s. limiting cooling rate for satisfactory performance is 7°C/s at a temperature of 590° C. Data- k= 0.038 J/mm.s.°C, R= 6°C/s, T_o = 27°C, T_c = 690° C, V= 28 V, I = 275 A, ρ*c = 0.0033 J/mm^3°C. [8M] List down important functions of flux material used in arc welding? [2M]	10	2, 4	4, 5	3.4.1/ 3.1.6
Q2 A	List down important points & draw neat schematic sketch of Shaper machine and also draw geometry of products it can manufacture and where it is used?	10	4	2	1.4.1
Q2 B	With the help of neat schematic sketch give one of specific application (in terms of product geometry only) of Horizontal turret lathe machine (no theory explanation required)? [5M], Explain the classification of NC machines based on "programming method" criteria?	10	4	1, 2	1.3.1
Q3 A	Explain material removal *mechanism* [2M] and *characteristics* [3M] of "Electro discharge machining" process? With the help of neat *sketch* explain Plasma arc welding [5M]?	10	3	2	1.3.1
Q3 B	Which of the following abrasive grit material grinding wheel can be applied for precision grinding of heat sensitive ferrous material? Justify the reason? [5M] a) White Al_2O_3 b) Brown Al_2O_3 c) Black SiC d) Green SiC Explain the factors required to be considered for selection of grinding wheel?	10	2, 4	1, 2	1.4.1
Q4 A	Determine *total time* required for (single finishing pass) face milling of top face and side milling of other four faces of Aluminium block having length of 450 mm, width 150 mm and height of 80 m? Helical fluted plain HSS milling cutter of	10	2, 4	3, 5	2.1.2

	diameter 60 mm, length 75 mm and have 6 teeth used for face milling of top surface & Helical fluted solid carbide End milling cutter of diameter 20 mm, length 75 mm and have 6 teeth used for side surface milling. Approach distance and over run distance are 5 mm each for tools, cutting velocity 40 m/min and feed is 0.25 mm/tooth, depth of cut 1 mm?				
Q4 B	The finished part shown in figure no 01 needs to be manufactured in one setup, desired geometric tolerances have to be satisfied by each part. Which milling machine you will prefer to satisfy above mentioned points [2M]. Explain any four important features of that machine which differentiate it from other milling machine [3M]?  Fig. no 01 For manufacturing spur gear having 137 numbers teeth's, suggest a *work holding device* having indexing mechanism, calculate the characteristics of accessories required if reduction ratio up to 40:1 available [5M]?	10	2, 4	1, 2	1. 4. 1
Q5 A	Enlist important (only five important) points to be consider for design of *clamp element*? [5M] Sketch the following and give their specific one application: *Box Jig*? [5M]	10	3	2	1. 3. 1
Q5 B	Give three important *characteristic features* of Gang drilling machine? [5M] For drilling through hole of diameter 16 mm in mild steel workpiece having thickness of 25 mm with HSS spiral fluted drill tool. Half of drill point angle is 55°, cutting velocity is 30 m/min, feed is 0.55 mm/rev, and approach and overrun distances for drill tool is 3 mm each. Calculate total *machining time* required to drill through hole and *material removal rate* [5M]?	10	2, 4	2, 3	1. 4. 1
Q6 A	Draw well labelled *Sketch* [3M] and explain thermoforming *molding process* [1M]. A steel slab of dimension 60 × 40 × 10 cm is produced using casting with the help of mould using a side riser. The riser is cylindrical in shape with diameter and height, both equal to D. The freezing ratio of the mould is (show the calculation)	10	3	2, 3	1. 4. 1
Q6 B	Calculate total machining time to turn copper cylindrical rod of diameter 75 mm X length 200 mm into finish component as shown in figure 2? Finish component has dimensions as shown in figure 2. For, Part A- Cutting velocity is 50 m/min, feed is 0.5 mm/rev & depth of cut is 1.25 mm for both outer diameter (O.D) turning and	10	4	2	1. 3. 1

	face turning operation. For, Part B- Cutting velocity is 35 m/min, feed is 0.4 mm/rev & depth of cut is 1.25 mm for outer diameter (O.D) turning. (Note – For calculating machining time of each next pass of outer diameter (O.D) turning, consider existing diameter of workpiece at that instant)  Figure no.2				
Q7 A	i) A manufacturing industry wants to manufacture 6 meters length of 6 inch X 6 inch cross section, 10 inch diametric cross section steel material in mass production. Suggest a manufacturing process [1M] and explain the basic steps involved [2M] with the help of well labelled schematic sketch [3M]? ii) Match the following [4M] 1. Dry sand core A. Moisture 2. Collapsibility of core B. High strength 3. Core print C. Hot tears 4. Green sand core D. Seat to position the core [4M]	10	2, 3	3, 5	2. 1. 2
Q7 B	A manufacturer receives a purchase order to manufacture the components as shown in figure no.3. Given data-Batch size: 1100 no's, material: cast metal, raw material: sand cast metal component with machining allowance of 1 mm on each surfaces. To finish this raw material into finish component shown in figure no.01, solve/explain the following points; i) State pre-machining sequence of machining process (machine tool used, cutting tool used and accuracy maintained in brief)? ii) Draw the assembly view of jig plate, jig bush and workpiece component for performing final drilling operation. iii) Define *selection, design* and *manufacturing* aspects for jig plate, jig bush system and other miscellaneous elements. State probable accuracy of jig plate surfaces and jig bush surfaces to be maintained (geometric tolerance). iv) Bill of materials required for one set.				

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End Semester Re-Examination - January 2020 Examinations

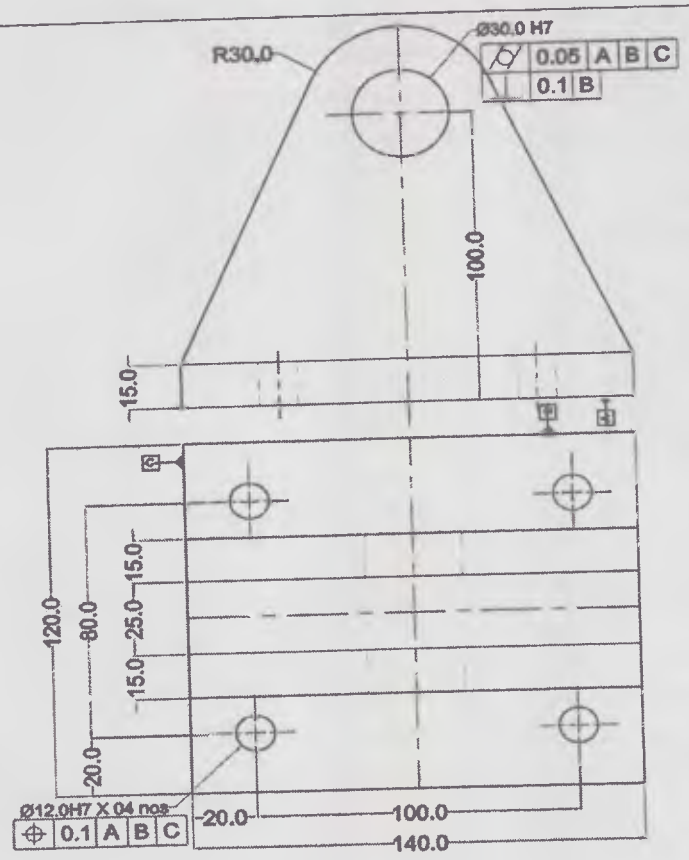
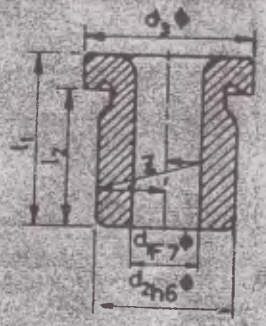


Figure no. 03



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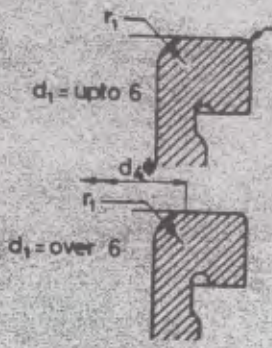
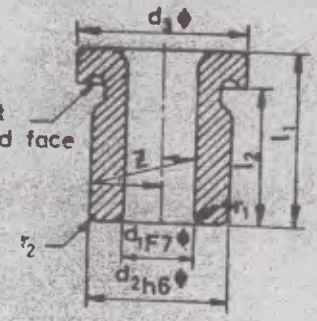
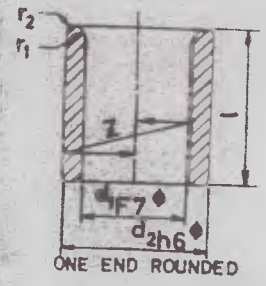


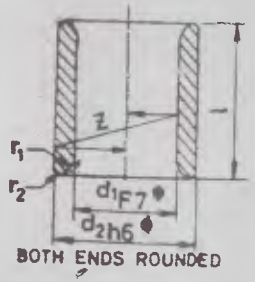
Detail of rounding



Bore rounded on both ends



ONE END ROUNDED



BOTH ENDS ROUNDED

FIXED BUSH

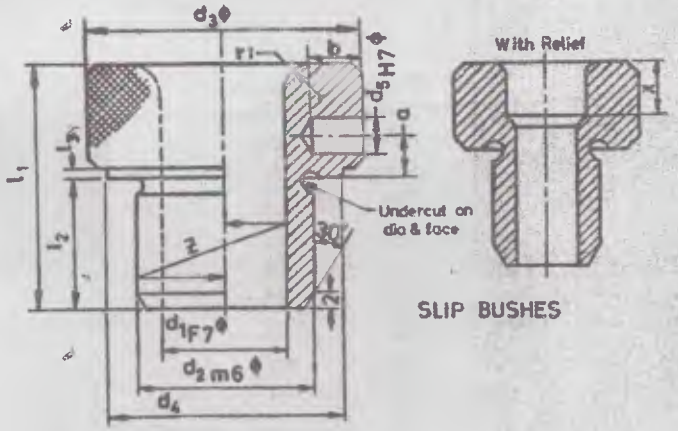
d_1	Short l_1	Short l_2	Long l_1	Long l_2	d_2	d_3	d_4	r_1	r_2	z
Upto 1	6	4	9	7	3	6	—	1.2	0.2	0.005
1.0—1.8	6	4	9	7	4	7	—	1.2	0.2	0.005
1.8—2.6	6	4	9	7	5	8	—	1.2	0.3	0.005
2.6—3.3	8	6	12	9	6	10	—	1.6	0.3	0.005
3.3—4.0	8	6	12	9	7	11	—	1.6	0.4	0.005
4.0—5.0	8	6	12	9	8	12	—	2.0	0.4	0.005
5.0—6.0	10	7	16	13	10	14	—	2.0	0.4	0.01
6.0—8.0	10	7	16	13	12	16	10	2.0	0.6	0.01
8.0—10	12	8	20	16	16	20	13	2.5	0.8	0.01
10—12	12	8	20	16	18	22	16	2.5	0.8	0.01
12—15	16	12	28	24	25	26	20	4.0	0.8	0.01
15—18	16	12	28	24	25	30	24	4.0	0.8	0.01
18—22	20	15	36	31	30	35	28	6.0	1.0	0.01
22—26	20	15	36	31	36	41	33	6.0	1.0	0.02
26—30	20	15	36	31	42	47	40	6.0	1.0	0.02
30—35	25	20	45	40	48	55	46	8.0	1.0	0.02
35—42	25	20	45	40	56	63	52	8.0	1.0	0.02
42—48	32	25	56	50	63	70	59	8.0	1.6	0.02
48—55	32	25	56	50	70	77	67	8.0	1.6	0.02
55—63	36	30	72	66	80	87	75	8.0	1.6	0.02

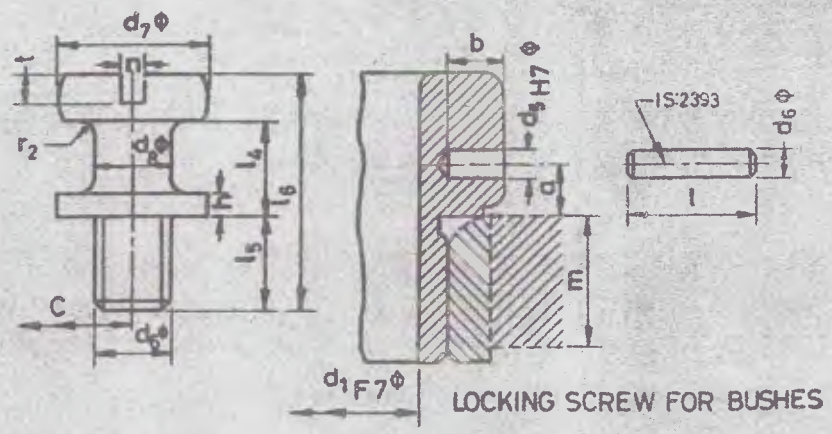
All dimensions in millimetres

LINER BUSH

63 to 65 HRC

d_1	Short	Long	d_2	r_1	r_2	z
Upto 1	6	9	3	1.2	0.2	0.005
1.0—1.8	6	9	4	1.2	0.2	0.005
1.8—2.6	6	9	5	1.2	0.3	0.005
2.6—3.3	8	12	6	1.6	0.3	0.005
3.3—4.0	8	12	7	1.6	0.4	0.005
4.0—5.0	8	12	8	2.0	0.4	0.005
5.0—6.0	10	16	10	2.0	0.4	0.01
6.0—8.0	10	16	12	2.0	0.6	0.01
8.0—10	12	20	16	2.5	0.8	0.01
10—12	12	20	18	2.5	0.8	0.01
12—15	16	28	22	4.0	0.8	0.01
15—18	16	28	25	4.0	0.8	0.01
18—22	20	36	30	6.0	0.8	0.01
22—26	20	36	36	6.0	1.0	0.02
26—30	20	36	42	6.0	1.0	0.02
30—35	25	45	48	8.0	1.0	0.02
35—42	25	45	56	8.0	1.0	0.02
42—48	30	56	63	8.0	1.6	0.02
48—55	30	56	70	8.0	1.6	0.02
55—63	36	70	80	8.0	1.6	0.02





SLIP BUSHES AND LOCKING SCREWS

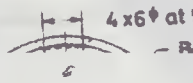
chamfer 1×45°
Material C 45; Hardness HRC 50

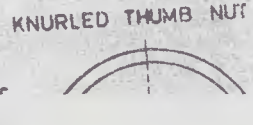
All dimensions in millimetres.

d_1	d_2	d_3	d_4	d_5	l_1	l_2	l_3	a	b	r_1	z	x
Upto 4	8	16	11	2.5	20	10	1	3	4	3	0.01	14
4— 6	10	19	14	2.5	22	12	1	3	4	3	0.01	12
6— 8	12	22	17	2.5	25	12	1	3	4	4	0.01	10
8—10	16	26	21	3.0	28	16	1	4	5	5	0.01	12
10—12	18	30	24	3.0	28	16	1	4	5	5	0.01	10
12—15	22	35	29	5.0	36	20	1	5	7	5	0.01	12
15—18	25	40	35	5.0	36	20	1	5	7	5	0.01	8
18—22	30	47	41	5.0	36	20	1	5	7	6	0.01	0
22—26	36	56	47	6.0	45	25	2	6	8	6	0.02	0
26—30	42	62	54	6.0	45	25	2	6	8	6	0.02	0
30—35	48	69	61	6.0	50	32	2	6	11	8	0.02	0
35—42	56	78	69	6.0	50	32	2	6	11	8	0.02	0
42—48	63	85	78	6.0	56	36	2	6	14	8	0.02	0

d_6	d_7	d_8	l_4	l_5	l_6	h	d_6 m6Φ × l	m	n	t	r_2	c
M 5							2.5×14	10				15
M 5							2.5×14	12				16
M 5	10	5	6	6	15	2	2.5×14	12	1.6	2.0	0.6	18
M 5							3.0×14	16				20
M 5							3.0×14	16				22
M 6							5 ×20	20				26
M 6	13	6	8	8	20	2	5 ×20	20	2.0	2.5	1.0	29
M 6							5 ×20	20				33
M 8							6 ×24	25				38
M 8							6 ×24	25				41
M 8	16	8	10	10	25	2.5	6 ×24	30	2.5	3.0	1.6	45
M 8							6 ×24	30				48
M 8							6 ×28	35				55

IS: 666 – 1962





(1)

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations- January 2020

Program: Mechanical Engineering
Course Code: BS-BTM301
Course Name: Applied Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six
3. Answers to sub questions should be grouped together

Q.No.	Questions	Points	CO	BL	PI
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^{t}}\right)dt=\frac{3\pi}{4}$	6	1	ii, iii	1.1 .1
(b)	Find the image of the rectangular region bounded by the lines $x=0,\ x=1,\ y=0,\ y=2$ in the z plane under the transformation $w=z+(2-i)$. Draw the sketch.	6	3	iv, v	2.4 .1
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8	4	ii, v	2.4 .1
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{-t}erf(\sqrt{t})\}$	6	1	i, ii	2.1 .1
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6	3	ii, iii	1.1 .1
(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8	4	ii, iii	1.1 .1

3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix} 8 & 3 & 6 & 1 \\ -1 & 6 & 4 & 2 \\ 7 & 9 & 10 & 3 \end{bmatrix}$	6	4	i, ii	2.4.1
(b)	Using method of Laplace Transforms solve following differential equation $(D^2 - D - 2)y = \sin 2t$ where $y(0) = 1$, $y'(0) = 2$	6	1	ii, iii	2.4.1
(c)	Find Fourier Series Expansion of following function in the interval $(0, 2\pi)$ $f(x)=\begin{cases} x & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$	8	2	iv, v	1.1, 1.1
4(a)	Find the image of the circle $\lvert z-1\rvert = 1$ under the transformation $\frac{1}{z}$	6	3	i, ii	1.1.1
(b)	Find Half Range Fourier sine Series of $f(x) = lx - x^2, \quad 0 < x < l$	6	2	iv, v	2.4.1
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. Hence find A^{-1}	8	4	ii, iii	2.4.1

3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix} 8 & 3 & 6 & 1 \\ -1 & 6 & 4 & 2 \\ 7 & 9 & 10 & 3 \end{bmatrix}$	6	4	i, ii	2.4 .1
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y = \sin 2t$ where $y(0)=1,\ y'(0)=2$	6	1	ii, iii	2.4 1
(c)	Find Fourier Series Expansion of following function in the interval $(0,2\pi)$ $f(x)=\begin{cases} x & 0\le x\le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$	8	2	iv, v	1.1 1
4(a)	Find the image of the circle $\lvert z-1\rvert = 1$ under the transformation $\frac{1}{z}$	6	3	i, ii	1.1 .1
(b)	Find Half Range Fourier sine Series of $f(x)=lx-x^2,\quad 0<x<l$	6	2	iv, v	2.4 .1
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. Hence find A^{-1}	8	4	ii, iii	2.4 .1